SCIENCE

A WEEKLY JOURNAL DEVOTED TO THE ADVANCEMENT OF SCIENCE, PUBLISHING THE OFFICIAL NOTICES AND PROCEEDINGS OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

FRIDAY, FEBRUARY 10, 1905.

CONTENTS:

MSS. intended for publication and books, etc., intended for review should be sent to the Editor of SCIENCE, Garrison-on-Hudson, N. Y.

*THE CARNEGIE INSTITUTION OF WASHINGTON.**

MINUTES OF SECOND MEETING OF THE BOARD OF TRUSTEES. [ABSTRACT.]

THE meeting was held in Washington, at the New Willard Hotel, on Tuesday, December 13, 1904, at 10 o'clock A.M. At 12:55 a recess was taken until 2 P.M. The chairman, Mr. Billings, occupied the chair. The secretary called the roll, and the following trustees responded: Messrs. Billings, Cadwalader, Dodge, Frew, Gilman, Hay, Higginson, Hitchcock, Hutchinson, Langley, Lindsay, Low, MacVeagh, Mills, Mitchell, Morrow, Root, Walcott, White and Wright. Absent: Messrs. Agassiz, Howe, Gage and Spooner. Letters were received from Messrs. Agassiz, Gage and Howe regretting their inability to be present.

The minutes of the last meeting of the board were presented, and on motion full reading was dispensed with and they were approved as per abstract furnished each member.

The president presented his resignation, as follows:

CARNEGIE INSTITUTION OF WASHINGTON,
December 13, 1904.

TO THE TRUSTEES OF THE CARNEGIE INSTITUTION.

Gentlemen: At your meeting, on December 8, 1903, I presented a letter saying:

"When I had the honor of being chosen the first president of the Carnegie Institution, I said to the trustees that from the nature of the case my tenure of office must be short, for, having passed the age of seventy years, I was looking forward to a release from serious official responsibilities.

* From Year Book, No. 3.

The term of five years was fixed in the by-laws, and three of them will have passed at the next annual meeting of the board. It is my intention at that time to resign the office of president, and this early notice is given in order that the trustees may be prepared then to take such action as may seem to them wise."

In accordance with this intimation, I now resign the office of President of the Carnegie Institution, and, as the title of the chief executive may, perhaps, be changed, I will add that I am not a candidate for reappointment under any other designation.

In taking this step, I beg leave to assure the board of my continued interest in the development of this institution according to the purposes of the founder; and I express to the members of the board, collectively and individually, my highest respect.

It has been an honor and a privilege to be so closely associated as I have been with the organization and progress of an institution which bids fair to be a most potent factor in the advancement of knowledge and in the encouragement of scientific men.

I am, gentlemen, very respectfully yours,

DANIEL C. GILMAN.

The following motion was then offered and passed:

Resolved, That the resignation of President Gilman be accepted; and in thus severing the harmonious relations which have existed between the president and the board and the president and the executive committee the trustees desire to express their full appreciation of the prestige that the retiring officer has brought to the Carnegie Institution of Washington by his presidency.

The secretary referred to various details of business and submitted the cash statement and financial statement as shown below.

The secretary also reported that since October 31, 1904, he had collected on sales of publications $589.01, and expended $31,895.21, leaving a cash balance on hand of $438,654.97 to date.

The consideration of the by-laws was next taken up.

After discussion and various suggestions as to the qualifications needed by a president of the Carnegie Institution at Washington, a ballot resulted in the election of Dr. Robert S. Woodward, dean of the scientific faculty of Columbia University, New York.

The election of members of the executive committee to fill the vacancies caused by the expiration of the terms of Messrs. Billings and Walcott resulted in their reelection to the class of 1907.

On submission of the report of the executive committee the chairman and secretary made a general statement of the plan of work and financial outlook. After discussion and some minor changes, resolutions were passed making the following general appropriations:

Reserve fund	$ 50,000
Publication fund, to be continuously available	40,000
Administration	50,000
Grants for departments and large projects	310,000
Grants for miscellaneous researches	168,000

At 4:50 P.M. the board adjourned.

Financial Statement.

	Dr.	Cr.
Endowment		$10,000,000
Reserve Fund		200,000
Investments:		
U. S. Steel Corporation Bonds, 5%	$10,000,000	
$100,000 Atch., Topeka and S. Fe Ry. Co. Gen'l Mtg. 4% 100-year Gold Bonds, Oct. 1, 1995.	100,112 50	
$100,000 N. Pac. Ry. Co. Prior Lien Ry. and Land Grant Gold Bonds, Jan. 1, 1997, 4%	101,800	
$50,000 Northern Pacific-Great Northern 4% Joint Bonds, Chicago, Burlington and Q. collateral, July 1, 1921	46,500	
$50,000 Lake Shore and Mich. Southern 4% D. Bonds	48,222 22	
Interest: Reserve fund investment		10,000
Other investments		380 69
Sales of publications		102 03
Grants: Large		69,321 24
Special		13,250 80
Minor		77,174 13
Publication		67,470 65
Administration		25,630 08
Furniture		1,065 51
Seal		1,500
Cash	469,961 17	
Available fund		300,700 76
	$10,766,595 89	$10,766,595 89

Receipts.			Amount.
1903.			
October 31. Balance			$445,471 69
Interest:			
U. S. Steel Corporation.	$500,000		
Atchison, Topeka and S. Fe Ry. Co	5,000		
N. Pacific Ry. Co	4,500		
N. Pacific-Gt. Northern	2,500		
Lake Shore and Michigan Southern	2,000		
Deposit U. S. Trust Co.	18,926 87		
Deposit Am. Sec. and Trust Co	77 39		
		$533,004 26	
Sales of publications:			
Index Medicus	2,370 47		
Year Book	52 85		
Other publications	12 75		
		2,436 07	
Revertments		329 33	
Marine Biol. Lab., Tortugas, Fla.:			
A. G. Mayer		669 70	
			536,439 36
			981,911 05

Disbursements.			Amount.
Investments:			
$50,000 N. Pacific-Gt. Northern 4 % Joint Bonds		$ 46,500	
$50,000 N. Pacific Ry. Co. Prior L. Ry. and L. Grant 4's		51,312 50	
$50,000 Atchison, Topeka and S. Fe. Ry. Co. G. Mtg. 4's		50,125	
$50,000 Lake Shore and Mich. Southern 4 % D. Bonds		48,222 22	
			$196,159 72
Large grants		49,848 46	
Minor grants		187,634 53	
Special grants		29,749 20	
			267,232 19
Publication			11,590 82
Administration			36,967 15
			511,949 88
Balance: U. S. Trust Co., N. Y.		461,902 46	
Balance: Nat'l City Bank, N. Y.		7,746 67	
Balance: Am. Sec. and Trust Co.		312 04	
			469,961 17
			981,911 05

CHAS. D. WALCOTT,
Secretary.

REPORT OF EXECUTIVE COMMITTEE ON THE WORK OF THE YEAR.

The executive committee began consideration of the various directions and authorizations given by the board of trustees immediately after the adjournment of the board, December 8, 1903; also of matters recommended by the committee and approved by the board.

The work of the committee and its recommendations for the fiscal year 1904–1905 are shown in this report.

During the fiscal year the committee held eight meetings. Its organization continued the same as for the fiscal year 1902–1903. Mr. Gilman acted as chairman and Mr. Walcott as secretary.

APPROPRIATIONS.

At the annual meeting of the board, December 8, 1903, the following appropriations were made for large projects:

Tropical Pacific exploration	*$40,000
Department of Experimental Biology	70,000
Department of Terrestrial Magnetism	20,000
Trans-Caspian Expedition, archeological exploration	18,000
Geophysical research	25,000
Investigation of mineral fusion and solution under pressure	$50,012
Study of elasticity and plasticity of solid bodies upon finite deformation	7,500
Preparation of a bibliography of geophysics	5,000
Department of Economics and Sociology	30,000
Bureau of Historical Research	8,500
	$211,500

* It being impracticable to secure the services of the person whom the executive committee expected to take charge of this work, the project was abandoned and the appropriation not drawn upon.

REPORTS ON LARGE PROJECTS.

DEPARTMENT OF EXPERIMENTAL BIOLOGY.

The subject of research in zoology was before the executive committee at its earliest meetings, and was under consideration for nearly two years before the specific recommendations for any large projects directly in charge of the Carnegie Institution were presented to the board of trustees. In Year Book No. 1 the special advisory committee on zoology made several recommendations of a broad bearing, one of them being that of establishing a permanent biological laboratory as a central station for marine biology in general. In the same Year Book there were printed two schemes for the establishment of biological experiment stations for the study of evolution—one by Dr. C. B. Davenport, who favored Cold Spring Harbor, Long Island, and a second by Professor Roswell P. Johnson, who favored a protected marine shore near fresh-water ponds. The executive committee consulted with many experts and carefully investigated the feasibility of making the Marine Biological

Laboratory, at Woods Hole, Mass., a central station. This was found to be impracticable, and the executive committee stated in its report to the board of trustees for 1903 that it had concluded that the best mode of dealing with this important field of research was to organize a biological experimental department, to which could be referred all questions and problems of evolution, specific differentiation, heredity, etc. This was to include the establishment of an investigating station at Cold Spring Harbor, where ground and some buildings were offered, and also the establishment of a collection and experimental marine biological station at the Dry Tortugas.

The above conclusions were accompanied by a recommendation that the department be established and allotments made to begin the work. The board of trustees approved the recommendations.

The department of experimental biology was organized by the appointment of Dr. Charles B. Davenport as director of the Station for Experimental Evolution at Cold Spring Harbor, Long Island, and Dr. Alfred G. Mayer as director of the Marine Biological Laboratory at the Dry Tortugas, Florida.

A grant of $34,250 was made to the station at Cold Spring Harbor, and of $20,000 to the Marine Biological Laboratory at the Dry Tortugas.

DEPARTMENT OF ECONOMICS AND SOCIOLOGY.

For the present purposes of the department the following named eleven divisions have been established, and the gentlemen whose names appear have been placed in charge of them, respectively:

Division 1. Population and Immigration.—Professor Walter F. Willcox, Cornell University, Ithaca, N. Y.

Division 2. Agriculture and Forestry, including Public Domain and Irrigation.—President Kenyon L. Butterfield, Rhode Island College of Agriculture and Mechanic Arts, Kingston, R. I.

Division 3. Mining.—Mr. E. W. Parker, Geological Survey, Washington, D. C.

Division 4. Manufactures.—Hon. S. N. D. North, Census Office, Washington, D. C.

Division 5. Transportation.—Professor W. Z. Ripley, Newton Centre, Mass.

Division 6. Domestic and Foreign Commerce.—Professor Emory R. Johnson, University of Pennsylvania, Philadelphia, Pa.

Division 7. Money and Banking.—Professor Davis R. Dewey, Institute of Technology, Boston, Mass.

Division 8. The Labor Movement.—Carroll D. Wright, 1429 New York Avenue, Washington, D. C.

Division 9. Industrial Organization.—Professor J. W. Jenks, Cornell University, Ithaca, N. Y.

Division 10. Social Legislation, including Provident Institutions, Insurance, Poor Laws, etc.—Professor Henry W. Farnam, 43 Hillhouse Avenue, New Haven, Conn.

Division 11. Federal and State Finance, including Taxation.—Professor Henry B. Gardner, 54 Stimson Avenue, Providence, R. I.

TERRESTRIAL MAGNETISM.

The subject of an international magnetic bureau is fully presented by Dr. L. A. Bauer in 'Year Book' No. 2, accompanying papers, pp. 203–212. The executive committee recommended to the board of trustees that a grant of $20,000 be made for magnetic research by the Carnegie Institution, it being proposed not to take up such magnetic work as is already well provided for by national bureaus, but only such as lies outside the proper sphere of activity of these bureaus, the nature of whose appropriations usually limit their work within the confines of their countries. Furthermore, the purpose is to gather together and unite in one harmonious whole all existing knowledge and facts, so that the directions in which future work can most profitably be accomplished will be set forth. The investigations promise not only to have scientific utility, but to reach results of great practical importance, *e. g.*, the determination of the magnetic data necessary for safe navigation at sea.

The favorable action of the trustees at the annual meeting in December, 1903, and the reference of the project to the executive committee resulted in the formation of a department of international research in terrestrial magnetism, with Dr. L. A. Bauer as director, and with authorization to begin work April 1, 1904. The first allotment was $20,000.

TRANS-CASPIAN ARCHEOLOGICAL EXPEDITION.

(Raphael Pumpelly, Newport, R. I., in charge. $18,000.)

In Year Book No. 2, pages 271–287, there is a brief report of Professor Raphael Pumpelly's first expedition to the Trans-Caspian region. The second expedition was for the purpose of archeological investigations in special areas noted on the first expedition. The following report is an indication of the character of the results obtained. The final report will be prepared as soon as practicable.

Professor Pumpelly left America in December, 1903. A week was passed in Berlin, where he engaged as archeologist Dr. Hubert Schmidt, of the Museum für Völkerkunde. Dr. Schmidt had excavated at Troy under Dörpfeld, and is an expert in prehistoric pottery. A month was passed in St. Petersburg in getting permission to excavate in Turkestan.

On the twenty-fourth of March work was begun at Anau, near Askhabad. The members of the party were Dr. Hubert Schmidt, archeologist; Ellsworth Huntington, R. W. Pumpelly; Langdon Warner, Hildegard Brooks, Homer Kidder, volunteer assistants.

SECONDARY GRANTS.

The following is a record of the grants, not already mentioned, made under the allotment of $200,000 for minor grants. A few reports on grants made in 1902–1903 are included, as the work under them was continued into the fiscal year 1903–1904:

ANTHROPOLOGY.

GEORGE A. DORSEY, Field Columbian Museum, Chicago, Ill. For ethnological investigation among the tribes of the Caddoan stock. $2,500.

WILLIAM H. HOLMES, director of Bureau of American Ethnology, Washington, D. C. For obtaining evidence relative to the history of early man in America. $2,000.

ARCHEOLOGY.

FREDERICK J. BLISS, New York, N. Y. For excavations in Syria and Palestine. $1,500.

GEORGE F. KUNZ, New York, N. Y. To investigate the precious stones and minerals used in ancient Babylonia, in connection with the investigation of Mr. William Hayes Ward. $500.

W. MAX MULLER, Philadelphia, Pa. For investigating monuments of Egypt and Nubia. $1,500.

WILLIAM HAYES WARD, New York. For a study of the oriental art recorded on seals, etc., from western Asia. $1,500.

ASTRONOMY.

LEWIS BOSS, Dudley Observatory, Albany, N. Y. For astronomical observations and computations. $5,000.

W. W. CAMPBELL, Lick Observatory, Mount Hamilton, Cal. For pay of assistants in researches at Lick Observatory. $4,000.

HERMAN S. DAVIS, Gaithersburg, Md. For a new reduction of Piazzi's star observations. $1,500.

GEORGE E. HALE, Yerkes Observatory, Williams Bay, Wis. For measurements of stellar parallaxes, solar photographs, etc. $4,000.

SIMON NEWCOMB, Washington, D. C. For determining the elements of the moon's motion and testing law of gravity. $2,500.

W. M. REED, Princeton Observatory, Princeton, N. J. For pay of two assistants to observe variable stars. $1,000.

SOLAR OBSERVATORY, MOUNT WILSON, CAL., Dr. George E. Hale, director. $15,000.

MARY W. WHITNEY, Vassar College, Poughkeepsie, N. Y. For measurement of astronomical photographs, etc. $1,000.

BIBLIOGRAPHY.

ROBERT FLETCHER, Army Medical Museum, Washington, D. C. For preparing and publishing the Index Medicus. $10,000.

EWALD FLÜGEL, Stanford University, Cal. For the preparation of a lexicon to the works of Chaucer. $7,500.

HERBERT PUTNAM, Washington, D. C. For preparing and publishing a handbook of learned societies. $5,000.

BOTANY.

DESERT BOTANICAL LABORATORY. Frederick V. Coville, Washington, D. C., and D. T. MacDougal, New York, N. Y., advisory committee. $5,000.

BURTON E. LIVINGSTON, University of Chicago, Chicago, Ill. For investigations of the relations of desert plants to soil moisture and to evaporation. $400.

E. W. OLIVE, University of Wisconsin, Madison. For researches on the cytology of certain lower plants. $1,000.

V. M. SPALDING, Tucson, Arizona. For investigation of absorption and transpiration of water by desert shrubs. $600.

CHEMISTRY.

JOHN J. ABEL, Johns Hopkins University, Baltimore, Md. For study of the chemical composition of the secretion of the supra-renal gland. $500.

WILDER D. BANCROFT, Cornell University, Ithaca, N. Y. For a systematic chemical study of alloys. $500.

CHAS. BASKERVILLE, College of the City of New York, New York City. For investigations of the rare earths. $1,000.

GREGORY T. BAXTER, Cambridge, Mass. For research upon the atomic weight of manganese. $500.

MOSES GOMBERG and LEE H. CONE, Ann Arbor, Mich. For study of triphenylmethyl and analogous compounds. $500.

H. C. JONES, Johns Hopkins University, Baltimore, Md. For investigations in physical chemistry. $1,000.

W. L. MILLER, University of Toronto, Toronto, Canada. For the study of electric migrations in solutions of weak acids. $500.

H. N. MORSE, Johns Hopkins University, Baltimore, Md. For development of a method for the measurement of osmotic pressure. $1,500.

A. A. NOYES, Massachusetts Institute of Technology. For researches upon: (1) Electrical conductivity of salts in aqueous solution at high temperatures; (2) Ionization of weak acids and bases and hydrolysis of their salts in aqueous solution at high temperatures; (3) Transference determinations in aqueous solutions of acids. $1,000.

THOMAS B. OSBORN, New Haven, Conn. For research on chemical substances yielded by proteids of the wheat kernel when decomposed by acids. $1,500.

THEODORE W. RICHARDS, Harvard University, Cambridge, Mass. For investigation of the value of atomic weights, etc. $2,500.

HENRY S. WASHINGTON, Locust, N. J. For the chemical investigation of igneous rocks. $1,200.

ENGINEERING.

W. F. DURAND, Stanford University, California. For experiments on ship resistance and propulsion. $4,120.

W. F. M. GOSS, Purdue University, Lafayette, Ind. For a research to determine the value of high steam pressures in locomotive service. $5,000.

EXPERIMENTAL PHONETICS.

E. W. SCRIPTURE, Yale University, New Haven, Conn. For researches in experimental phonetics. $2,700.

GEOLOGY.

T. C. CHAMBERLIN, University of Chicago, Chicago, Ill. For study of fundamental principles of geology. $6,000.

BAILEY WILLIS, U. S. Geological Survey, Washington, D. C. For geological exploration in eastern China. $12,000.

GEOPHYSICS.

FRANK D. ADAMS, McGill University, Montreal, Canada. For investigation on flow of rocks. $1,500.

G. K. GILBERT, Washington, D. C. For preparing plans for investigating subterranean temperatures. $1,000.

HISTORY.

ANNIE HELOISE ABEL, New Haven, Conn. For investigating the early Indian policy of the United States. $150.

WILLIAM WIRT HOWE, New Orleans, La. For preliminary inquiry into the subject of an investigation on legal history and comparative jurisprudence. $1,000.

MATHEMATICS.

DERRICK N. LEHMER, Berkeley, Cal. For pay of assistants to make the entries in a table of smallest divisors. $500.

E. J. WILCZYNSKI, Berkeley, Cal. For investigation of ruled surfaces, etc. $1,800.

PALEONTOLOGY.

OLIVER P. HAY, American Museum of Natural History, New York, N. Y. For monographing the fossil chelonia of North America. $3,000.

G. R. WIELAND, Yale University, New Haven, Conn. For continuation of researches on living and fossil cycads, and illustration of memoir on the structure of the latter. $2,300.

PHYSICS.

S. J. BARNETT, Stanford University, Cal. For research on the electric displacement induced in a certain dielectric by motion in a magnetic field. $250.

WILLIAM CAMPBELL, Columbia University, New York, N. Y. For research on the heat treatment of some high-carbon steels. $1,500.

H. S. CARHART, University of Michigan, Ann Arbor, Mich. For preparation of material for standard cells, etc. $500.

C. D. CHILD, Colgate University, Hamilton, N. Y. For investigation of the ionization in the neighborhood of a mercury arc in a vacuum. $50.

HENRY CREW, Evanston, Ill. For study of certain arc spectra. $1,000.

GEORGE E. HALE, Mount Wilson, Cal. For experiments on the use of fused quartz for the construction of optical mirrors. $3,000.

E. PERCIVAL LEWIS, University of California, Berkeley, Cal. To investigate vacuum-tube spectra of gases and vapors. $500.

A. A. MICHELSON, University of Chicago, Chicago, Ill. For aid in ruling diffraction gratings. $1,500.

R. W. WOOD, Johns Hopkins University, Baltimore, Md. For research, chiefly on the theory of light. $500.

PHYSIOLOGY.

W. O. ATWATER, Wesleyan University, Middletown, Conn. For investigations in nutrition. $7,000.

RUSSELL H. CHITTENDEN, Sheffield Scientific School of Yale University, New Haven, Conn. For a study of the minimal proteid requirement of the healthy man. $1,500.

ARTHUR GAMGEE, Montreux, Switzerland. For preparing a report on the physiology of nutrition. $6,500.

HIDEYO NOGUCHI, University of Pennsylvania, Philadelphia, Pa. For continuation of the studies on snake venoms. $1,700.

EDWARD T. REICHERT and AMOS P. BROWN, University of Pennsylvania, Philadelphia, Pa. For research on the crystallography of hæmoglobin. $1,000.

ZOOLOGY.

A. J. CARLSON, Stanford University, Cal. For research on the physiology of the invertebrate heart. $100.

W. E. CASTLE and E. L. MARK, Museum of Comparative Zoology, Cambridge, Mass. For experimental studies in heredity. $500.

HENRY E. CRAMPTON, Columbia University, New York, N. Y. For determining the laws of variation and inheritance of certain lepidoptera. $500.

J. E. DUERDEN, University of Michigan, Ann Arbor, Mich. For continuation of investigation on the morphology and development of recent and fossil corals. $1,500.

CARL H. EIGENMANN, University of Indiana, Bloomington, Ind. For investigation of blind fishes in Cuba. $1,000.

L. O. HOWARD, Department of Agriculture, Washington, D. C. For preparing a report on American mosquitoes. $2,500.

C. E. MCCLUNG, Kansas University, Lawrence, Kans. For making a comparative study of the spermatogenesis of insects, etc. $500.

WILLIAM PATTEN, Hanover, N. H. For studies relating to the origin of vertebrates. $500.

RAYMOND PEARL, University of Michigan, Ann Arbor, Mich. For an investigation by statistical methods of correlation in variation. $500.

W. L. TOWER, University of Chicago, Chicago, Ill. For an investigation of the potato beetles of Mexico. $445.

H. V. WILSON, University of North Carolina, Chapel Hill, N. C. For morphology and classification of deep-sea sponges. $1,000.

N. YATSU, Columbia University, New York. For experimental studies of the Nemertine egg. $300.

MARINE BIOLOGICAL LABORATORY, Woods Hole, Mass. J. Blakely Hoar, treasurer. For maintenance of 20 tables. $10,000.

NAPLES ZOOLOGICAL STATION, Naples, Italy. For maintenance of two tables. $1,000.

RESEARCH ASSISTANTS.

The policy in relation to research assistants, as outlined in Year Book No. 2, pp. xlvii–xlviii, was continued, and the persons below named conducted investigations in the branches of science indicated:

C. E. Allen, Madison, Wis. For a study of the homologies of the gametophyte and sporophyte, etc. $1,000.

A. F. Blakeslee, Cambridge, Mass. For an investigation of sexuality in the lower fungi. $1,000.

W. W. Coblentz, Cornell University, Ithaca, N. Y. For investigating infra-red emission and absorption spectra. $1,000.

A. L. Dean, New Haven, Conn. For investigating the proteolytic enzymes of plants. $1,000.

L. E. Dickson, University of Chicago, Chicago, Ill. For certain mathematical investigations. $1,000.

H. W. Doughty, Johns Hopkins University, Baltimore, Md. For an investigation of camphoric acid, under the direction of Professor A. A. Noyes. $1,000.

C. B. Farrar, Towson, Md. For psychological experiments at the Sheppard and Enoch Pratt Hospital. $1,000.

William Jones, New York, N. Y. For investigating the religion of the central group of Algonkian Indians. $1,000.

A. S. King, Bonn, Germany. For the production and study of emission spectra at high temperatures. $1,000.

P. A. Levene, New York, N. Y. For researches along the line of determining points in the constitution of proteids. $1,000.

R. S. Lillie, University of Nebraska, Lincoln, Nebr. For a study of the relation of ions to the various forms of protoplasmic movement. $1,000.

G. D. Louderback, San Francisco, Cal. For a study of the glaucophane and associated schists. $1,300.

F. E. Lutz, Bloomsburg, Pa. For study of organic evolution at Station for Experimental Evolution, Cold Spring Harbor, Long Island. $1,000.

U. B. Philips, University of Wisconsin, Madison, Wis. For a study of the influence of plantation in political and social history of the south. $300.

F. E. Ross, Washington, D. C. For astronomical investigation, under Professor Simon Newcomb.

L. S. Rowe, University of Pennsylvania, Philadelphia, Pa. For a study of Mexican constitutional system. $1,200.

P. E. Sargent, Cambridge, Mass. For an investigation in comparative neurology. $1,000.

G. W. Scott, Philadelphia, Pa. For a study of private claims against foreign nations to which the United States has been a party. $1,200.

E. S. Shepherd, Cornell University, Ithaca, N. Y. For a systematic study of alloys, with especial reference to brasses and bronzes. $1,000.

G. H. Shull, University of Chicago, Chicago, Ill. For an investigation in heredity, hybridization, variation, mutation, etc. $1,000.

Mary Roberts Smith, Palo Alto, Cal. For studying the history and social conditions of the Chinese immigration in California. $1,000.

Nettie M. Stevens, Bryn Mawr College, Bryn Mawr, Pa. For an investigation of problems relating to sex determination, etc. $1,000.

J. B. Whitehead, Johns Hopkins University, Baltimore, Md. For study of the magnetic effect of electrical displacement. $1,200.

E. J. Wilczynski, Berkeley, Cal. For an investigation of ruled surfaces, etc. $1,800.

Fritz Zerban. Munich, Germany. For an investigation of rare earths, under the direction of Professor C. Baskerville. $1,000.

PUBLICATIONS.

The following publications have been issued during the year:

Year Book No. 2, 1903. Octavo, 371 pages.

'Report of Committee on Southern and Solar Observatories.' Extracted from Year Book No. 2. Octavo, 170 pages.

'Desert Botanical Laboratory of Carnegie Institution.' Publication No. 6. By F. V. Coville and D. T. MacDougal. Octavo, 58 pages 29 plates.

'New Method of Determining Compressibility.' Publication No. 7. By T. W. Richards and W. N. Stull. Octavo, 45 pages, 5 text figures.

'Contributions to Stellar Statistics.' First paper. On the Position of the Galactic and other Planes toward which the Stars tend to Crowd. Publication No. 10. By Simon Newcomb. Quarto, 30 pages.

'Production of Sex in Human Offspring.' Publication No. 11. By Simon Newcomb. Octavo, 34 pages.

'The Action of Snake Venom upon Cold Blooded Animals.' Publication No. 12. By Hideyo Noguchi. Octavo, 16 pages.

'The Influence of Grenville on Pitt's Foreign Policy, 1787–1898.' Publication No. 13. By E. D. Adams. Octavo, 79 pages.

'Guide to the Archives of the Government at Washington.' Publication No. 14. Octavo, 250 pages.

'Fecundation in Plants.' Publication No. 15. By D. M. Mottier. Octavo, 187 pages.

'Contributions to the Study of the Behavior of the Lower Organisms.' Publication No. 16. By H. S. Jennings. Octavo, 256 pages.

'Traditions of the Arikara.' Publication No. 17. By G. A. Dorsey. Octavo, 202 pages.

'Researches on North American Aeridiidæ.' Publication No. 18. By Albert P. Morse. Octavo, 56 pages, 8 plates.

The following are in press:

'Coloration in *Polistes*.' Publication No. 19. By Wilhelmine M. Enteman. Octavo, 88 pages, 6 colored plates.

'The Coral *Siderastræa radians*.' Publication No. 20. By J. E. Duerden. Quarto, 144 pages, 11 plates.

'Mythology of the Wichita.' Publication No. 21. By G. A. Dorsey. Octavo, 353 pages.

'The Waterlilies.' Publication No. 22. By H. S. Conard. Quarto, 280 pages, 30 plates.

'Bacteria in Relation to Plant Diseases.' By Erwin F. Smith. Quarto.

'Explorations in Turkestan.' By R. Pumpelly, R. W. Pumpelly, W. M. Davis and Ellsworth Huntington. Quarto.

'Collected Mathematical Works of G. W. Hill.' It is estimated that these works will make four quarto volumes. Volume I. is in type.

'Catalogue of Double Stars.' By S. W. Burnham. 350 pages in type.

The following are authorized:

'Evolution, Racial and Habitudinal, controlled by segregation.' By J. T. Gulick.

'Chimera—a Memoir on the Embryology of Primitive Fishes.' By Bashford Dean. Manuscript not received, but plates are prepared.

'Bibliographic Index of North American Fungi.' By W. G. Farlow. Will make five octavo volumes. 250 pages in type.

'Results of Investigations of Poison of Serpents.' By Drs. Simon Flexner and Hideyo Noguchi. Manuscript not received.

'Heredity of Coat Characters in Guinea Pigs and Rabbits.' By W. E. Castle.

'Mutants and Hybrids of the Oenotheras.' By D. T. MacDougal.

'Astronomical Manuscript.' By C. H. F. Peters.

'Memoir on Fossil Cycads.' By G. R. Wieland.

'Description of the New Oxygen Apparatus Accessory to the Calorimeter.' By W. O. Atwater.

'Rotation of the Sun as Determined from Motion of the Calcium Flocculi.' By G. E. Hale and Philip Fox.

LIST OF ACCOMPANYING PAPERS.

'A Study of the Conditions for Solar Research at Mount Wilson, California.' By George E. Hale.

'The Southern Observatory Project.' By Lewis Boss.

'Methods for Promoting Research in the Exact Sciences.' By Dr. Simon Newcomb, Professor H. H. Turner, Karl Pearson, Lord Rayleigh, G. H. Darwin, Arthur Schuster, Edward C. Pickering.

'Fundamental Problems of Geology.' By T. C. Chamberlin.

'Plans for Obtaining Subterranean Temperatures.' By G. K. Gilbert.

'Proposed Magnetic Survey of the North Pacific Ocean.' By L. A. Bauer and G. W. Littlehales, Capt. E. W. Creak, Superintendent O. H. Tittmann.

'Geological Research in Eastern Asia.' By Bailey Willis.

*MATHEMATICAL PROGRESS IN AMERICA.**

IN the remarks that follow I shall limit myself to a brief consideration of progress in pure mathematics. This I may do the more appropriately inasmuch as one of my predecessors, Professor R. S. Woodward, at the annual meeting of 1899 gave an account of the advances made in applied mathematics during the nineteenth century. In his address, which was published in the *Bulletin of the American Mathematical Society*, for January, 1900, is included a description of the more important advances made by Americans in the field of applied mathematics.

In tracing the development of pure mathematics in America it seems convenient to recognize three periods. The first period extends from colonial days up to the establishment of the Johns Hopkins University in 1876; the second period extends from the establishment of the Johns Hopkins University up to 1891, when the New York Mathematical Society took on a national character and began the publication of its *Bulletin;* the third period extends from 1891 up to the present time.

The most valuable source from which the general reader may secure information in regard to the first period mentioned above is a work entitled 'The Teaching and History of Mathematics in the United States.' This work, written by Professor Florian Cajori, was published in 1890 by the United States Bureau of Education.†

Before the founding of the Johns Hopkins University there was almost no attempt made to prosecute or even to stimulate in a systematic manner research in the field of pure mathematics. Such mathematical journals as were published were scientifically of little importance and as a

* Presidential address delivered at the annual meeting of the American Mathematical Society, December 29, 1904.

† Circular of Information No. 3, 1890.

rule lived but a year or two. The only exception that we need mention was the *Analyst* edited by Dr. J. E. Hendricks and published at Des Moines, Ia., from 1874 to 1883; and the publication of this journal began practically at the close of the period referred to above.

However, there was a certain number of men, for the most part self trained, who were eminent among their fellows for their mathematical scholarship, their influence upon the younger men with whom they came in contact, and their capacity for independent investigation. Of these the most conspicuous were Adrain, Bowditch and Peirce. Adrain is known for his apparently independent discovery of the law of distribution of errors; Bowditch is known for his translation of Laplace's 'Mécanique Celeste' accompanied by a commentary of his own; and Peirce is now known chiefly for his classical memoir, 'Linear Associative Algebra,' which was the first important research made by an American in the field of pure mathematics.

With the arrival of Professor Sylvester at Baltimore and the establishment of the *American Journal of Mathematics,* began the systematic encouragement of mathematical research in America. Professor Sylvester drew about him a body of deeply interested students, and through his own untiring efforts and his inspiring personality a most powerful stimulus was exerted upon the mathematical activities of all who were associated with him. His work here, however, continued only six years. In 1884 he returned to England to take the chair offered to him by Oxford University.

The first ten volumes of the *American Journal of Mathematics,* published from 1878 to 1888, contained papers contributed by about ninety different writers. Of these thirty were mathematicians of foreign countries. Almost one third of the remaining sixty were pupils of Professor Sylvester; the others were mathematicians some of whom had come under the influence of Benjamin Peirce, some of whom had been students at German universities and some of whom were in large degree self-trained. They seemed to need only the opportunity of publication and a circle of readers to induce them to rush into print. In fact, several of them had already sent papers abroad for publication in foreign journals. Among the contributors to early volumes of the *American Journal of Mathematics* we should especially mention Newcomb, Hill, Gibbs, C. S. Peirce, Johnson, McClintock, Story, Stringham, Craig and Franklin.

We must at this point give some attention to the rapidly increasing influence of the German universities upon American mathematical activity. For some time a considerable number of young Americans, attracted by the superior opportunities offered by the German universities, had been going abroad for the study of the more advanced branches of mathematics. The lectures of Professor Klein, of Göttingen, were in particular the Mecca sought by young Americans in search of mathematical knowledge. I think that it may be said safely that at the present time ten per cent. of the members of the American Mathematical Society have received the doctorate from German universities, and that twenty per cent. of its members have for some time at least pursued mathematical studies in Germany. It is not surprising that as a result a large portion of the American mathematical output shows evidence of direct German influence if not of direct German inspiration.

In 1883, as we have already indicated, the publication of the *Analyst* was discontinued. In the following year a new journal, the *Annals of Mathematics,* under the editorial management of Professor Stone, of the University of Virginia, be-

gan publication. This journal was of a somewhat less ambitious character than the *American Journal of Mathematics*. It is interesting to note in connection with it that to a considerable extent its pages were given to papers on applied mathematics. In 1899 the *Annals* passed into the editorial control of the Mathematical Department of Harvard University. Since that time it has been largely expository or didactic. It has not sought to publish new investigations of an extended character, although it has not hesitated to publish brief papers announcing new results.

Let us now turn to a brief review of the history of the society which brings us together on this occasion.

At a meeting held November 24, 1888, six members of the department of mathematics of Columbia University formed a society, which was to meet monthly for the purpose of discussing mathematical topics and reading papers of mathematical interest. At the meeting held a month later they resolved to call their society the New York Mathematical Society and to invite the cooperation of all persons living in or near New York city who might be professionally interested in mathematics. By the end of the year 1889 the membership of the society had increased to sixteen. By the end of 1890 it had increased to twenty-two.

At the meeting held in December, 1890, the first president of the society, Professor J. H. Van Amringe, retired from office, and Dr. Emory McClintock was elected his successor. At the same meeting it was proposed that the society publish a mathematical bulletin. The officers of the society a month later made a report in which they recommended that the bulletin, if established, should not seek to enter into competition with existing mathematical journals, but that it should be devoted primarily to historical and critical articles, accounts of advances in different branches of mathematics, reviews of important new publications, and general mathematical news and intelligence. They showed at the same time that the expense connected with such a publication would necessitate an extension of the membership of the society together with an increase in the annual dues. It was suggested, accordingly, that a general circular be issued, describing the aims of the society and inviting suitable persons to become members.

After hearing the report, the society authorized the secretary to undertake a preliminary correspondence with a few of the principal mathematicians of the country with a view to determining whether their favor and assistance might be secured for the proposed enterprise. A month later the secretary reported that he had received favorable responses from Professor Simon Newcomb, Professor W. Woolsey Johnson, Professor Thomas Craig and Professor H. B. Fine. As a result of these favorable responses the society decided to approve and adopt the plan recommended by the officers of the society for the extension of its membership and for the publication of a historical and critical review of pure and applied mathematics. A circular letter of invitation such as had been recommended was issued shortly thereafter. The proposals which it contained seemed to meet with general favor, and by June, 1891, the membership of the society had increased to one hundred and seventy-four. The first number of the *Bulletin* was issued in October, 1891. Its appearance seemed to increase the interest already excited, and by the summer of 1892 the membership of the society had risen to two hundred and twenty-seven.

Professor Klein and Professor Study, who visited the United States in 1893 for the purpose of attending the International

Mathematical Congress held in Chicago, were present at the meeting of the society held in October of that year. They both delivered addresses before the society and expressed great interest in its work.

By the spring of 1894 it was felt generally that the operations of the society had assumed a national character, and a new constitution was adopted providing for a change of name from the New York Mathematical Society to the American Mathematical Society. In June of the same year the society undertook to provide means for the publication of the papers read at the Chicago congress the preceding year, and arrangements were made for holding a 'summer meeting' in conjunction with the Brooklyn meeting of the American Association for the Advancement of Science.

At the annual meeting held December, 1894, Dr. Emory McClintock retired from the presidency, being succeeded by Dr. George W. Hill. At this meeting Dr. McClintock delivered an address which was published in the *Bulletin* for January, 1895. It was entitled 'The Past and Future of the Society' and contains an account of the society during the first six years of its existence. Upon the occasion of Dr. McClintock's retirement from the presidency the society adopted a resolution expressing its appreciation of the great services that he had rendered while presiding officer, and its recognition of the fact that largely to his initiative were due the broadening of organization and extension of membership which made the society properly representative of the mathematical interests of America.

The next event of special importance in the history of the society occurred in 1896. Immediately after the summer meeting of that year, which was held in connection with the Buffalo meeting of the American Association for the Advancement of Science, the society's first 'colloquium' took place. Interesting and instructive courses of lectures were delivered by Professors Bôcher and Pierpont, and at the close of the colloquium those participating in it recommended that similar arrangements be made periodically in connection with subsequent summer meetings. In the same year, for the regular October meeting of the society was substituted a special meeting at Princeton in connection with the sesquicentennial celebration of Princeton University. At that meeting the society was addressed by Professor Klein and Professor J. J. Thomson.

In the spring of 1897 the Chicago section of the society was established. At the same time, it was determined to replace the meetings held monthly in New York by meetings held four times a year at intervals of two months. The summer meeting of 1897 was held at Toronto in connection with the meeting of the British Association for the Advancement of Science. It was attended by a number of visitors from Great Britain, among whom were Professors Forsyth, Greenhill and Henrici.

A colloquium was held in the summer of 1898 at Harvard University. There was much discussion among those attending it in regard to the need of larger and better facilities for the publication of mathematical researches. The following winter the society proposed to the Johns Hopkins University that the *American Journal of Mathematics* should be enlarged and issued more frequently, and that the society should be given a share in the editorial control of the *Journal*. The society was, however, unable to reach an agreement with the Johns Hopkins University, and in April, 1899, the society determined to establish an organ of its own for the publication of the more important original papers presented at its meetings. The financial resources of the society were not sufficient to carry on the work already begun and at

the same time to provide for the new publication; but it was found possible to secure assistance from ten colleges and universities which promised to join in support of the undertaking. The new publication, known as the *Transactions of the American Mathematical Society*, made its first appearance in January, 1900.

Simultaneously with the meeting held by the society in October, 1899, was held the first meeting of the newly organized American Physical Society. On this occasion the Mathematical Society met with the Physical Society for the purpose of listening to the address of President H. A. Rowland of the Physical Society. Again, two months later, on the occasion of the annual meeting of the American Mathematical Society, the two societies met in joint session for the purpose of listening to the presidential address of Professor R. S. Woodward, of the Mathematical Society. In this connection it may be of interest to recall that the organization of the American Physical Society was modelled, in a general way, after that of the Mathematical Society. The two societies have many members in common and have uninterruptedly enjoyed the most cordial relations.

In 1901 the Mathematical Society was compelled to turn its attention to the care of its rapidly growing library. An agreement was made with Columbia University whereby that institution undertook to bind and catalogue the books belonging to the society and to make the arrangements necessary for the loan of the books to members. In return therefor the university is able to make use of the society's collection in the way of a reference library. In October, 1901, the American Physical Society met again in joint session with the Mathematical Society for the purpose of listening to a paper by Professor Hadamard, who was visiting America as a delegate to Yale's bicentennial celebration.

In May, 1902, the San Francisco section of the society was established. In December of the same year Professor E. H. Moore delivered his address as president of the society. Very largely as a result of this address, the influence of the society was exerted to bring about the organization of associations of teachers of mathematics with a view to improving the methods of mathematical teaching. The Association of Teachers of Mathematics in New England was organized in April, 1903. The Association of Teachers of Mathematics in the Middle States and Maryland was organized in November of the same year. Several similar associations have been organized more recently in various sections of the country.

Two events have occurred during the year now closing which are of sufficient importance to deserve mention here. One is the determination of the society to publish in book form the mathematical lectures delivered at the colloquium held in Boston in 1903. The other is the meeting held last summer in connection with the International Scientific Congress at St. Louis.

In connection with this brief outline of the society's history it is, perhaps, desirable to indicate in figures the growth of the society and its work. During the past ten years the membership of the society has doubled, rising from about 250 in 1894 to almost 500 at the present time. Ten years ago the number of papers presented each year at the meetings of the society was in the neighborhood of 30, of which about a dozen were subsequently published. During the year 1903–04 the number of papers presented at meetings of the society was 154 and the number of papers published by members after presentation was 85. In January, 1902, when the present administration of the society's library began the number of volumes in the library was 121, while at present it is almost 2,000.

If any one wishes to have pass before him in review the scientific activities of the Mathematical Society he has only to consult two pamphlets issued a few months ago. I refer to the general index to the first thirteen volumes of the society's *Bulletin*, compiled by Dr. Emilie N. Martin and to the index to the first five volumes of the *Transactions* compiled under the direction of the editor-in-chief of the *Transactions*. The American Mathematical Society to-day serves to bring together into a harmonious whole all the mathematical activities of America. It is only infrequently that a mathematical paper of importance is published without having been read previously at a meeting of the society. To give an account of the present condition of the society is practically the same as to give an account of the present condition of American mathematics.

Nothwithstanding the great progress recently made in America by our science, we are far from being in a position that we can regard as entirely satisfactory. We have only to look about us in order to see that improvement is not only possible but necessary in almost every direction.

In the first place, the most pressing demand, perhaps, is that those engaged in lecturing on the more advanced branches of mathematics at American universities should be given greater opportunities for private study and research. At present the time of almost every university professor is taken up to a very large extent with administrative matters connected with the care of comparatively young students. Discussions in regard to admission requirements, the courses of study, discipline and the control of athletics absorb a large part of the time and strength of the faculty of every university. It is possible that this situation will in the course of the next twenty years be greatly relieved by a change, which many consider is already in sight. This change is nothing more or less than the relegation of the first two years of the ordinary college course to the secondary school and the establishment of university courses that will begin with the present third year of the college. The progress made in recent years by the public high schools makes it plain that before long they will be able without difficulty to duplicate the first two years of the present college course, and as more highly trained teachers take up the work of these schools there is no doubt that there will be a constantly increasing effort to take up this work. If this be done, not only will the condition of the secondary schools be greatly improved, but our university teachers will secure the relief so greatly needed for the advancement of the highest interests of our science.

In the second place, it is of the greatest importance that the mathematical journals already established in this country—the *Bulletin of the American Mathematical Society*, the *Annals of Mathematics*, the *American Journal of Mathematics* and the *Transactions of the American Mathematical Society*—should all be encouraged and assisted to extend their influence and increase their efficiency. It is the duty of every member of the society to interest himself to the greatest possible extent in the work of each of these journals. It is important also that we should strive to secure for these journals more adequate financial support. In other countries it is not unusual for the government itself to give financial support to such publications.

In the third place, we must have improved methods of teaching, better textbooks and more good treatises on advanced subjects. The members of the society, working as individuals, can do much along these lines. The society as a whole, let us hope, will some day be able to render important assistance in the publication of

mathematical works of the best type. It is quite possible that in some cases direct translation from foreign languages would be highly beneficial. Many of the most important mathematical works published in German, French or Italian are at once translated so as to be accessible in all three of these languages. Is there no lesson in this for us? An English translation of the new 'Encyclopedia of Mathematics' would probably do much to spread throughout this land of seventy-five million inhabitants a knowledge of and an interest in advanced mathematics.

Finally, we must not relax our efforts to increase and improve the opportunities offered those interested in mathematics to meet one another for the purpose of exchanging their views upon mathematical topics. The society must encourage, even to a greater extent than hitherto, the holding of mathematical colloquiums, sectional meetings, largely attended general meetings, and international congresses.

THOMAS S. FISKE.

THE AMERICAN MATHEMATICAL SOCIETY.

THE eleventh annual meeting of the American Mathematical Society was held at Columbia University on Thursday and Friday, December 29–30. The attendance at the several sessions included forty-nine members. The retiring president, Professor T. S. Fiske, occupied the chair. The council announced the election of the following persons to membership in the society: Mr. G. I. Gavett, Stanford University; Mr. M. E. Graber, Heidelberg University, Tiffin, Ohio; Mr. E. B. Lytle, University of Illinois; Professor R. E. Moritz, University of Washington; Dr. B. L. Newkirk, University of California. Fourteen applications for membership were received. A committee was appointed to arrange for the summer meeting.

At the opening of the afternoon session on Thursday, President Fiske delivered his retiring address, the subject being 'Mathematical Progress in America.' The address, published in the present issue of SCIENCE, dealt with the general development of mathematics in this country and especially with the powerful influence exerted by the society since its organization in 1888. Professor Fiske was himself one of the founders of the society, which owes much to his initiative and valuable services as secretary, editor of the *Bulletin* and the *Transactions* and in other official capacities culminating in the presidential office.

At the annual election, which closed on Friday morning, the following officers and members of the council were chosen:

President—W. F. Osgood.

Vice-Presidents—E. W. Brown and James Pierpont.

Secretary—F. N. Cole.

Treasurer—W. S. Dennett.

Librarian—D. E. Smith.

Committee of Publication—F. N. Cole, Alexander Ziwet, D. E. Smith.

Members of the Council to serve until December, 1907—E. R. Hedrick, T. F. Holgate, E. O. Lovett, L. A. Wait.

An informal dinner on Thursday evening, attended by about thirty-five of the members, added much to the pleasure of the meeting.

The *Annual Register* of the society, this year a book of 76 pages, including the catalogue of the library, has just been published. The total membership is now 473, of whom 32 are life members. The number of papers presented during the year 1904 was 118. The treasurer's report shows a balance of $3,884.28 on hand December 27, 1904. The library now contains over 2,000 volumes.

The following papers were read at the annual meeting:

MAX MASON: 'The doubly periodic solutions of Poisson's equation in the plane.'

VIRGIL SNYDER: 'On the forms of sextic scrolls having no rectilinear directrix.'

A. B. Coble: 'Some applications of a theorem in the theory of forms.'

L. E. Dickson: 'The group of a tactical configuration.'

T. S. Fiske: Presidential address, 'Mathematical progress in America.'

Maurice Fréchet: 'Sur les opérations linéaires (deuxième note).'

F. Morley: 'On an inversive relation between five points of a plane.'

J. E. Wright: 'Application of the theory of continuous groups to a certain differential equation.'

Edward Kasner: 'Geometry of point correspondences: osculating homographies.'

C. H. Sisam: 'On septic scrolls.'

E. V. Huntington: 'Note on definitions of groups, abelian groups, and fields.'

E. V. Huntington: 'A set of postulates for ordinary complex algebra.'

Burke Smith: 'On the deformation of surfaces of translation.'

L. E. Dickson: 'A general theorem on algebraic numbers.'

A. B. Coble: 'The similar projective groups of a cubic space curve and a quadric surface.'

E. H. Moore: 'On a definition of abstract groups.'

The Chicago Section of the society met at Chicago, on December 30–31. The next meeting of the society will be held on February 25. The San Francisco Section will meet on the same date.

F. N. Cole,
Secretary.

THE GEOLOGICAL SOCIETY OF AMERICA.

The seventeenth annual meeting of the Geological Society of America was held at the University of Pennsylvania, Philadelphia, December 29–31, 1904, under the presidency of Professor John C. Branner, of Stanford University. Sixty-one papers, divided among eight branches of the science, were presented for reading, and about one hundred members of the society were in attendance, making the convention one of the largest in its history. The report of the council for the year 1904 shows that in all respects the affairs of the society are in a highly satisfactory condition. The net active membership of the society was reported as being 259, and 15 new members were elected at the Philadelphia meeting. During the past year, five members have been removed by death, Professor C. E. Beecher, J. B. Hatcher, Henry McCalley, W. H. Pettee and Charles Schäffer. Memorials of these members were read at the first session of the Philadelphia meeting.

The report of the treasurer showed that the society had a balance in the treasury, December 1, 1904, of $1,973.68 and invested funds amounting to $8,300. The volume of the *Bulletin* of the society comprises 636 pages of text, with 75 illustrations, the articles being divided among nine branches of the science, of which stratigraphic geology occupies about one half. The library of the society, which is deposited with the Case School of Applied Science in Cleveland, now comprises some 2,600 numbers, of which 1,400 are bound volumes.

Professor Branner chose as the subject of his presidential address, 'Geological and Geographical Studies on the Northeast Coast of Brazil,' and illustrated his paper by means of numerous photographs and charts. The most peculiar feature of this coast is the series of hardened sandspits occurring at the mouths of most of the rivers. These spits consist of quartzose sand which has been cemented together into a hard solid rock by means of calcium carbonate brought down in solution by the rivers and precipitated by contact with the waters of the ocean, which here possess a high degree of salinity. This hardening extends to a depth of several feet and, in many instances, has been of great economic importance through the formation thereby of natural breakwaters, forming safe harbors, as at Pernambuco. The spits contain many fossils, all of which are of living species. A second coast feature of importance

is the series of coral reefs which alternate or which are associated with the sandspits in certain localities. These reefs seem to be comparatively thin, but many of them are wide. That the coast has remained stationary for a considerable time is indicated by the fact that these reefs reach to the upper limit of coral growth, where they show broad areas of dead coral within the fringe of living animals.

In the restricted space of a summary report like the present it will not be possible to do more than briefly outline the contents of the more important of the 43 papers which were actually read, leaving out of account those which were read only by title.

Dr. Robert Bell, director of the Geological Survey of Canada, read a somewhat detailed paper on the geology of the region in the vicinity of the Great Slave Lake, and illustrated his remarks by maps and sections made for the Canadian Survey.

Professor E. R. Cumings, of the Indiana State University, discussed the development and morphology of *Fenestella*, and showed that this Devonian bryozoa is related genetically to the cyclostomata. In a paper concerning new evidences of the geographical differences of fossil faunas of the same age, Professor H. S. Williams, of Cornell University, stated that extended study of the Devonian rocks of the eastern United States pointed to the conclusion that geological faunas once thoroughly established probably possessed a geological range far greater than is indicated by the actual range in any particular section.

The petrographic and economic papers were introduced by Professor James F. Kemp, of Columbia University, in a paper detailing observations made along the garnet contact zones and associated copper ores at San José, Tamaulipas, Mexico. These contact zones are the result of the action of an intruded bed of andesite upon the surrounding Cretaceous limestone. Geologically the formation of garnets has been the most important feature and has resulted from the rearrangement and recrystallization of the materials present in the limestone. The chalcopyrite, which is the important ore, is a later phase of the contact phenomena. In another communication Professor Kemp described his method of 'Geological Bookkeeping,' which is a system of taking notes in the field and of locating the observations upon the field map, based upon a series of definite and invariably subdividing squares. This leads to a compilation book in which the observations of scattered seasons are entered upon pages which correspond in their enumeration to the series of squares on the field map. It is believed that the system possesses advantages in affording permanency and intelligibility of records even though the latter be made at widely diverse times and by different individuals.

In a paper on the occurrence and distribution of celestite-bearing rocks, Professor E. H. Kraus, of Michigan State University, stated that the mineral occurs widely throughout central New York and southern California. The percolating waters have leached out the crystals to a considerable extent, forming the so-called 'vermicular' limestones of New York and the 'gashed' and 'acicular' dolomites of Michigan. Precipitation of the material from these waters is the source of the large deposits of celestite which occur at Put-In Bay, the Maybee Quarry, Monroe County, Mich., and elsewhere.

Professor T. C. Hopkins, of Syracuse University, described the closely crystalline, fine, fossiliferous, metamorphic limestones of central and southern California which contain the wonderful deposits of tourmaline and other gems which have been obtained within the past few years from

Eldorado County southward to the national boundary.

According to Dr. G. P. Merrill, of the National Museum, the so-called asbestos (fibrous serpentine) of the Thetford Mines, Canada, and elsewhere, fills cavities which were made by the shrinkage of the massive serpentine in which the fibrous material occurs, and he advances arguments to prove that the filling process is due to crystallization from the walls of the cavities inward.

Messrs. Ralph Arnold and A. M. Strong, of the California State University, described at length the crystalline rocks of the San Gabriel Mountains near Pasadena, Cal. The last of the petrographical papers was by Dr. G. M. Murgoci, of Bucharest, Roumania, and concerned the origin of the peculiar rock known as riebeckite granite, suggesting that the change from normal granite was due to heavy pressure combined with motion.

Five papers on physiographical geology were presented, three of which were read in full. Professor N. M. Fenneman, of the University of Wisconsin, in a paper on the control of the form of contact surfaces by marine denudation, laid down the principles that the nature of a surface of unconformable contact between strata is determined by two factors: (1) the topography of the early land surface, and (2) cliff erosion during submergence. The first element would preserve the former land-surfaces in the subsequent beds, while the dominance of the second element would make the contact surface in every case a plane.

Professor R. S. Tarr, of Cornell University, described some drainage features of southern central New York showing the relation of the pre-glacial valleys to the present surface. In many instances along the divide between the Susquehanna and St. Lawrence drainage system there is a condition of lowered divides, across some of which, as in the Tioughnioga valley, east of Cortland, and Cayuta Creek valley, west and south of Van Etten, the present drainage passes. Three theories may be adduced to account for these phenomena: glacial erosion, erosion by ice-fed stream and head-water erosion during rejuvenation. Evidence from valley form, glacial deposits and hanging tributary valleys is presented to prove that these drainage features are in many cases, if not in all, due to changes of earlier date than the advance of the Wisconsin ice sheet. While the influence of possible earlier ice advances, of which no evidence has been found in this region, is not eliminated, the facts so far discovered favor the hypothesis of rejuvenation rather than of glacial action during earlier ice advance.

The next paper pertained to hanging valleys and was by Professor Israel C. Russell, of the University of Michigan. He recognizes four classes of such valleys, each of which contains several varieties. The author considers that too much stress has been laid upon the existence of lateral glaciated hanging valleys on the sides of glaciated troughs and he advances evidence to show that in certain instances at least such valleys are not due in a conspicuous manner to differentiation of glacial erosion. The study of glaciated hanging valleys is intimately connected with a still greater problem, namely, the origin of the leading features in the relief of such mountains as the Sierra Nevada range and the Cascades. There is good reason for thinking that these two ranges were deeply stream-sculptured prior to the glacial epoch.

Under the head of physical and structural geology twelve papers were read. Professor C. K. Leith, of the University of Wisconsin, discussed in masterly fashion the present state of knowledge of the subject of rock cleavage, with special reference to recent publications by Dr. Becker and

himself. The author has devised a piece of apparatus which mechanically illustrates his theories in a remarkable manner. Professor E. H. Kraus, in a paper on the origin of the caves of the island of Put-In Bay, Lake Erie, stated that in all probability the folding of the Lower Helderberg limestone of the region was caused by hydration of anhydrite, since large deposits of gypsum have been encountered in sinking wells in the immediate vicinity. The increase in volume caused by such hydration may be as high as sixty per cent. and the energy developed in the process would be sufficient to account for the results observed. Subsequent leaching out of the gypsum by percolating waters would account for the existence of the caves, and the collapse of the roofs of the cavities would account for the step-like form of the ceiling.

Mountain growth and mountain structure was the subject of a communication from Mr. Bailey Willis, of the United States Geological Survey. The study of peneplains at various altitudes with reference to sea level, in North America and Eurasia, demonstrates that elevations of the earth's surface have resulted from deformation which produced warping of previously levelled-off surfaces. In general this process has been a recent one, post-Mesozoic in time, and it may be held that mountains are youthful features of the earth. The structures which have been discovered in mountain masses are such as are developed under a considerable load, and consequently at notable depths in the earth's mass. Study of the relation between structure and form leads to the conclusion that modern mountains are not the effects of the forces which produce the structure, a conclusion which cuts at the foundation of older systems of classification.

Professor Florence Bascom, of Bryn Mawr, brought out by means of detailed maps the nature of the formation and the structure of the Piedmont region of Pennsylvania, giving the results of extended field work carried on for the United States Geological Survey. Her paper was followed with one on the Piedmont of Maryland in correlation with that of Pennsylvania by Professor E. B. Mathews, of Johns Hopkins University. The latter author afterward read a paper on the Cockeysville marble, in which he gave the results of much very close field study by himself and W. J. Miller, of Baltimore, into the concrete problem in Piedmont structure, the area concerned occupying approximately 300 square miles and lying north of the city of Baltimore.

Mr. N. H. Darton, of the United States Geological Survey, in discussing overlap relations along the Rocky Mountain front range, described features which have been traced by him through Wyoming and Colorado into New Mexico, mainly for the purpose of correlating the different forms. He finds that the Paleozoic and Mesozoic rocks of the region present frequent variation in character, occurrence and varieties. In the course of his field work, Mr. Darton visited the Zuñi salt lake, forty miles north of the Indian pueblo of Zuñi. At this locality there is in the plain a circular depression about a mile in diameter, containing a salt lake and two cinder cones. The depth of the depression is about 200 feet and its walls are of Cretaceous sandstone, capped on one side by a lava flow. All around the rim there is a wide low ridge of volcanic ejecta which has been laid down in water. The history of this remarkable feature is not clear.

Professor Frank C. Adams, of McGill University, presented the results of an investigation made by himself and Mr. E. J. Coker into the cubic compressibility of rocks and certain phases of rock flow. The

apparatus employed was an improvement of that which had been used by Professor Adams in some remarkable experiments, the results of which were published five years ago. In the present experiments, nickel-steel tubes have been used and the compressibility of fourteen typical rocks determined, and the deformation of the rock-making minerals concerned were carefully studied by means of the microscope.

Mr. E. O. Hovey, of the American Museum of Natural History, presented three papers upon the Caribbean volcanic islands. He described the Soufrière of St. Lucia as being the result of waning volcanic activity manifested along ancient fissures, but not within any recognizable crater. The Boiling Lake of Dominica is considered to be within an ancient broken-down crater from the southern portion of which there was a superficial eruption of dust and fine lapilli in 1880. The third of these papers pertained to the present condition of Mont Pelé, which was stated to be in a condition of intermittent mild activity; the dome, which has formed as a feature of the eruptions which began in 1902, is still undergoing modifications, elevation and subsequent destruction by explosion being nearly balanced. The great spine was destroyed more than a year ago.

The six papers upon glacial geology which were read gave rise to much discussion. The first of the series was by Professor R. S. Tarr, upon the moraines of the Seneca and Cayuga Lake valleys. During the recession of the Wisconsin ice sheet a stand was made near the heads of the two lake valleys—Cayuga and Seneca. This major ice stand consisted of a series of minor halts in the receding ice which projected lobes up the two lake valleys, and minor lobes into the side valleys. By reason of the irregularity of topography and the several minor halts, a complex series of moraines was accumulated, both as lateral and terminal deposits, the latter being developed with especial intensity in the two major valleys south of the heads of the lakes.

The drumlins in the Grand Traverse region of the northwestern part of the southern peninsula of Michigan have been studied recently by Mr. Frank Leverett, of Ann Arbor, Mich., who contributed a paper on them which, in the absence of the author, was read by Professor Russell. Particular attention was devoted to modes of development, since more than one mode appears to have been operative; some drumlins have been sculptured from earlier deposits at the last ice advance, and some built up during that advance from material contained in the ice. Attention was called incidentally to heavy deposits of nearly pebbleless laminated clay, apparently laid down in interglacial lakes, for this clay has been molded to some extent into drumlin forms by a subsequent ice invasion. Large valleys excavated in this interglacial clay were briefly discussed and shown to antedate the production of the drumlins, the latter being in some cases built upon the valley bottom.

A second paper upon the drumlin areas of Michigan was delivered by Professor Russell. It described with some detail two regions in the northern peninsula of Michigan, in which drumlins form the most conspicuous features of the topography. One of these areas includes Les Cheneaux Islands and a part of the adjacent mainland, on the north shore of Lake Huron; and the other area is situated principally in Menominee County, to the west of Green Bay. The drumlins are for the most part smooth-surfaced, half-cigar-shaped hills of the normal type, but in a few instances instructive irregularities are present. Among these irregularities are: A flattening of a portion of the normally elliptical ground-plan, as if a marginal portion of a

well-shaped drumlin had been removed by erosion, leaving an abnormally steep slope; deep transverse trenches at right angles to their longer axes; straight or curved trenches extending from their summits down their sides; irregular pits in their normally smooth surfaces; and, in one instance, a terrace-like shelf with a convex longitudinal profile, parallel with the crest-line of the drumlin on the side of which it occurs. In the valleys between the drumlins there are several eskers. From the evidence the conclusion is drawn that the drumlins of the Menominee area were produced by ice erosion from a previously deposited till sheet.

The drumlins of central New York State were the subject of a brief paper by Professor H. L. Fairchild, of the University of Rochester, who also summarized the more important glacial problems in the state. A third paper by Professor Fairchild took up the thesis that the theory of erosion by ice is a fallacy, in amplification of a paper presented by him at the preceding annual meeting of the society. The author gave arguments for arriving at the conclusion that deep ice-erosion of living rock has never been proven, and that it is practically impossible of accomplishment. In New York State there seems to be positive proof that there has been no effective excavation by ice in the valleys of the Finger Lakes, the field study thus sustaining the theoretical consideration of the question.

The stratigraphical section of the program showed the largest number of titles of papers offered and read. Professor W. G. Miller, of Toronto University, discussed the pre-Cambrian rocks in the vicinity of Lake Temiskaming, Ontario, not only from a stratigraphical, but also from an economic, point of view. The region in question shows at the base a complex assemblage of igneous rocks, including granite. Erosion of this complex has given rise to conglomerate and finer-grained slate-like rocks. Afterwards ensued a second period of erosion during which arkose and quartzite were deposited on the surface of the older two series. Finally each of these three series is intersected by dykes of pre-Paleozoic age. The second group or series, the conglomerate and slate, is of economic interest on account of the occurrence therein of fissure veins carrying important amounts of silver and of cobalt and nickel ores and smaller quantities of other ores.

In a paper on the paleogeography of St. Peter time, Dr. C. P. Berkey, of Columbia University, showed by means of charts and sections the probable varying distribution of land and water during the formation of the St. Peter sandstone of Minnesota. The rock was interpreted as of marine origin where early deposited. The region then became a land area with the production of sand-dune phenomena, after which there occurred another period of submergence. In the discussion which followed the reading of the paper the fact was brought out by Professor Gilbert van Ingen that rounded sand grains are not necessarily an indication of arid conditions of deposition, since they are found in coastal sand-dunes today. Dr. Berkey's second paper was upon the stratigraphy of the Uinta Mountains and announced the discovery of an erosion interval in the section, which favored the reference of the great basal Weber quartzite to Cambric age, rather than to Carbonic, as held by King, or to Devonic, as contended by Powell.

Professor A. W. Grabau, of Columbia University, in a paper on the relative areas of the Oneida and Shawangunk conglomerates advanced the theory that these beds represent different portions of a basal conglomerate in the transgressing Siluric sea. In another paper, Professor Grabau discussed Helderberg seas and the interrela-

tionships of lower Devonic strata in the eastern United States. Charts were used in showing the long narrow Cumberland sea as this body of water is called. Mr. C. A. Hartnagel then, in some notes on the Ontaric (Siluric) section of eastern New York, traced the comparative sections to the west and to the east of the Helderberg Mountains and showed the continuous character of the Cobleskill beds. On the east the formation immediately beneath this is, probably, Salina in age, down to and through the Shawangunk conglomerate as the basal member of the Salina group.

The age of the Morrison formation of the Rocky Mountain region was the theme discussed by Mr. N. H. Darton, who has carried on extensive field work along the outcrops. It has been found that the Morrison formation is of wide extent in the Rocky Mountain region, from Montana to New Mexico, but evidence as to its age is meager. Abundant mammalian remains occur, but the paleontologists do not agree as to the horizon, some investigators regarding them as Jurassic and others as late Cretaceous. The meager fresh-water molluscan fauna is not definitive. Some time ago, Mr. Willis T. Lee found evidence that Morrison shales give place to Comanche deposits in western Oklahoma, and the author has found similar relations in the Two Butte uplift in southeastern Colorado, and concludes that the Morrison strata are of Comanche (Lower Cretaceous) and that sandstones occur representing both the Lakota and the Dakota sandstones of the Black Hills region.

In a paper on the classification of the Upper Cretaceous formations of New Jersey, Professor Stuart Weller, of Chicago University, reviewed the schemes proposed by the state survey at various times, and, by means of fossils, substantiated the subdivision which had been made by Knapp and Kümmel on lithologic grounds alone. Professor Weller then went on to discuss in detail in a second paper the fauna of the Cliffwood, N. J., clays, which form the most notable example of marine sedimentation in New Jersey during Raritan time.

The fossils of Cook's Inlet and the Alaska peninsula have been made the subject of careful study by Messrs. T. W. Stanton and G. C. Martin, of the United States Geological Survey. The section shows a great thickness of beds which are well provided with fossils. The beds seem to be closely related to the Jurassic strata of Russia. The scientific program was closed by Professor G. H. Perkins, of Vermont University, with a paper on the Tertiary lignite of Brandon, Vermont, and its fossil fruits. These historic beds were worked for fuel during the anthracite coal strike and as a result many specimens of fossil fruits were found, most of which are described now for the first time.

The following papers were read by title only: 'Occurrence of Gem Minerals in San Diego, Riverside and San Bernardino Counties, Cal.,' by George F. Kunz; 'Rocks from Mt. Desert Island, Maine,' by Persifor Frazer; 'Plumose Diabase and Palagonite from the Holyoke Trap Sheet,' by B. K. Emerson; 'Determination of Brucite as a Rock Constituent,' by Alexis A. Julien; 'Origin of Leached Phosphate,' by C. H. Hitchcock; 'Serpentine Deposits of Belvidere Mountain, Vermont,' by V. F. Marsters; 'The Shifting of the Continental Divide at Butte, Montana,' by Walter H. Weed; 'Nantucket Shorelines, III. Muskeget,' by F. P. Gulliver; 'The Dexter, Kansas, Nitrogen Gas Well,' by Erasmus Haworth; 'Relation of Lake Whittlesey to the Arkona Beaches,' by Frank B. Taylor; 'New Geological Formation in the Eo-Devonian of Annapolis County, Nova Scotia,' by H. M. Ami; 'Age of the Marine Limestones of West Bay, near Parrsborough, Cumberland County, Nova Scotia.'

by H. M. Ami; 'Upper Trias of the Lander Basin, Wyoming,' by S. W. Williston; 'The "Red Beds" of Southwestern Colorado,' by Whitman Cross and Ernest Howe; 'Pleistocene History of Fishers Island, N. Y.,' by Myron L. Fuller; 'Pleistocene of the Chesapeake and Delaware Basins,' by A. Bibbins; 'The Loess of the Lower Mississippi,' by G. Frederick Wright; and 'The Loess and Associated Interglacial (Post-glacial) Deposits,' by B. Shimek.

The following candidates were elected to fellowship in the society: Nevin M. Fenneman, University of Wisconsin; Charles N. Gould, University of Oklahoma; Mark S. W. Jefferson, Michigan State Normal College; Benjamin L. Miller, Bryn Mawr College; Cleophas C. O'Harra, South Dakota School of Mines; Albert H. Purdue, University of Arkansas; Solon Shedd, Washington Agricultural College; Bohumil Shimek, Iowa State University; Gilbert Van Ingen, Princeton University; Ralph Arnold, U. S. Geological Survey; John A. Bownocker, Ohio State University; Reginald W. Brock, Canadian Geological Survey Department; Hiram D. McCaskey, Chief of the Mining Bureau of Manila; Henry Montgomery, Trinity University, Toronto; Arthur E. Seaman, Michigan College of Mines.

The officers of the society for the ensuing year are:

President—Raphael Pumpelly, of Dublin, N. H.
First Vice-President—Samuel Calvin, of Iowa City, Ia.
Second Vice-President—W. M. Davis, of Cambridge, Mass.
Secretary—H. L. Fairchild, of Rochester, N. Y.
Treasurer—I. C. White, of Morgantown, W. Va.
Editor—J. Stanley-Brown, of New York City.
Librarian—H. P. Cushing, of Cleveland, O.

EDMUND OTIS HOVEY.

SCIENTIFIC JOURNALS AND ARTICLES.

The American Naturalist for November-December contains the following articles: 'The Embryological Development of the Skeleton of the Head of Blatta,' William A. Riley; 'The Arboreal Ancestry of the Mammalia,' W. D. Matthew; 'Localized Stages in Common Roadside Plants,' Joseph A. Cushman; 'An Arrangement of the Families and Higher Groups of Birds,' R. W. Shufeldt; 'Observations on Hearing and Smell in Spiders,' Annie H. Pritchett; 'Amitosis in the Embryo of Fasciolaria,' H. L. Osborn; 'The Transplanting of Trout in the Streams of the Sierra Nevada,' D. S. Jordan; 'A New Species of *Diaptomus* from Mexico,' A. S. Pearse; '*Hyla andersoni* and *Rana virgatipes* at Lakehurst, New Jersey,' W. T. Davis. There are also notes, reviews and lists of publications.

Annals of the Carnegie Museum, Vol. III., No. 1, contains the following papers: 'Minute (or Order) Book of the Virginia Court Held for Ohio County, Virginia, etc.,' edited by Boyd Crumrine; 'The Tropidoleptus Fauna at Canandaigua Lake, New York, with the Ontogeny of Twenty Species,' Percy E. Raymond; 'Two (new) Species of Turtles from the Judith River Beds of Montana,' O. P. Hay (*Baëna callosa* and *Aspideretes beecheri*), and 'A Preliminary List of the Hemiptera of Western Pennsylvania,' P. Modestus Wirtner.

The Zoological Society Bulletin, of New York, for January contains accounts of the newly erected ostrich house and small mammal house, a note on 'Wild Animal Photography,' a description of 'A Mosquito Object-Lesson at the Aquarium' and other interesting and valuable information regarding the work of this very active society.

The American Geologist for December contains as the leading article a paper by Charles S. Prosser assisted by Edgar R. Cumings, entitled 'The Waverly Formations of Central Ohio,' illustrated by three plates of half-tone views of the formations described. The region considered, which is near Columbus, had never been carefully described; but on investigation it affords the most satisfactory exposures of the Waverly formations to be found in central Ohio. Mr. N. Mistockles continues his serial on 'The Untenableness of the Nebular Theory' and Professor Hobbs

has the concluding chapter on the 'Tectonic Geography of Eastern Asia.' G. P. Grimsley contributes a paper entitled 'A Theory of Origin for the Michigan Gypsum Deposits,' in which he supposes that they were deposited in an interior sea, and in explanation of the localization of the deposits compares it with the present Caspian Sea.

SOCIETIES AND ACADEMIES.

THE GEOLOGICAL SOCIETY OF WASHINGTON.

The 161st meeting of the society was held on Wednesday evening, January 11, 1905. The regular program comprised the following communications:

Undulations of Certain Layers of the Lockport Limestone: Mr. G. K. Gilbert.

Mr. Gilbert exhibited photographic views of two structures affecting beds near the top of the Lockport limestone. These had been previously described and figured by Hall, in his report on the geology of the fourth district of New York. One structure is a system of domes or arches occupying the whole surface of the rock and separated by narrow synclines. They are usually several feet in diameter, and are repeated downward through a series of strata. The other structure is a mammillation somewhat resembling ripple marks, and with a diameter of about one inch. The two structures occur in the same strata. The photographs were made in a new railroad cutting within the city of Niagara Falls, in a quarry three miles east of the city, and in water channels temporarily exposed at the Dufferin Islands, on the Canadian side. Mr. Gilbert was not satisfied with Hall's characterization of the structures as concretionary, but suggested no alternative. He thought them contemporary with the deposition of the strata, and not subsequent.

The Great Fault of the Bitterroot Mountains: Mr. W. Lindgren.

The Bitterroot Mountains in the western part of Montana rise for a distance of eighty miles like a long narrow block above the general level of a greatly dissected plateau or peneplain which extends over a large area in central Idaho and a part of the adjacent state of Montana. On the east the Bitterroot Mountains descend from an elevation of 9,000 feet to the level of the wide Bitterroot valley. From one end of the range to the other this slope is remarkably even and gentle, having an average declivity of twenty degrees. Its face consists of a zone of granite schist, perhaps averaging 1,000 feet thick, in which pressing and deformation of the crystals are intimately associated with numberless slipping planes with striation parallel to the slope of the front plane. The predominant rock of the range is a quartz monzonite with transitions into granite. These facts are interpreted as meaning that the frontal slope is formed by a great flat fault of normal character, along which both molecular and molar movement has occurred. The horizontal component would be at least 15,000 feet, the vertical at least 4,000. The depth below the surface at which this zone of schistosity was formed can scarcely have been more than 2,000 to 4,000 feet. The age of the uplifted peneplain is believed to be late Mesozoic and the fault is probably but little later. Slight faulting movements seem to continue along it up to the present time.

Artesian Water in Crystalline Rocks: Mr. Geo. Otis Smith.

The presence of artesian water in an area of crystalline rocks in the vicinity of York, Me., presents a hydrologic problem little discussed in geological literature. With closely folded and thoroughly indurated rocks the water circulation in the deeper rock zone must be along schistosity partings and joint openings rather than through pore openings in a gently inclined porous stratum. The impervious cover essential to the artesian type of supply of ground water is furnished by the greater degree of cementation of the natural openings in the rock near the surface. It thus follows that the pressure under which the water circulates in the rock becomes insufficient to overcome the internal friction near the surface, and upward escape is prevented. When a free vertical channel is provided by a well, the water rises in the well and in three cases cited overflows at the surface. The results of this hydrologic investi-

gation will be presented in the forthcoming 'Contributions to Hydrology in the Eastern United States.'

Some Erratic Boulders in Middle Carboniferous Shale in Indian Territory: Mr. J. A. TAFF.

Mr. Taff described the occurrence of erratic boulders of limestone, dolomite, chert and quartzite, of Silurian, Ordovician and probably Cambrian ages occurring in Middle Carboniferous shales several thousand feet above the base of the Carboniferous section in the Ouachita Mountains from the west end almost to the Arkansas line, a distance of nearly a hundred miles. The boulders range in size from an extreme length of sixty feet to small fragments and are promiscuously distributed in the shale. Some of them are angular while others are round as if water worn. No rocks in the Ouachita Mountains can be compared with the erratic boulders except probably some of the Ordovician cherts which occur 10,000 feet beneath the boulder bearing shale. The Arbuckle Mountains lie southwest of the Ouachita range in southwestern Indian Territory and trend nearly S. 60° W. almost at right angles to the bearing of the folds of the Ouachitas. The Arbuckle uplift extended southeastward beneath the Cretaceous will pass twelve to fifteen miles south of the west end of the Ouachita Mountains. The identity, lithological and paleontological, of a large part of the Ordovician and Silurian strata, in the Arbuckle uplift, with the erratic boulders in the Carboniferous shale of the Ouachita Mountains, and the local relations of the uplifts press toward the conclusion that the erratics had their sources in a range or group of mountains in the region now occupied by southern Indian Territory and northern Texas. The size of the boulders and their disposition in the marine shales show that without any reasonable doubt they were floated by the medium of ice from a mountainous land into a Carboniferous sea now occupied in part at least, by the Ouachita Mountains. The hypothesis of ice transportation is supported by the occurrence of certain scored or striated chert and limestone boulders found with other erratics in the shale. The cause of the scorings found in the chert boulders is a problem now receiving further study. A fuller discussion concerning the occurrence and characteristics of these erratic boulders will be published at an early date in some geological journal.

GEO. OTIS SMITH,
Secretary.

THE BOTANICAL SOCIETY OF WASHINGTON.

THE twenty-third regular meeting of the Botanical Society of Washington was held Saturday evening, October 16, 1904. The following papers were presented:

Vitality of Buried Seeds: Dr. J. W. T. DUVEL.

A review was given of the results of the germination tests of 112 different samples of seed which had been buried in a heavy clay soil for one year. The seeds were buried at the three different depths of 6–8, 18–22 and 36–42 inches.

The majority of the seeds retained their vitality better the deeper they were buried.

With but few exceptions, the seeds of cultivated plants had either decayed or germinated and afterward decayed, at all depths.

Weed seeds, in some cases, retained their vitality remarkably well. The results indicate that the preservation of the vitality of weed seeds when buried in the soil is directly proportional to the noxiousness of the plants producing them.

Drug Plant Investigations in the Department of Agriculture: Dr. RODNEY H. TRUE.

The present organization of this line of investigations includes two different lines of work. Field investigations are now being carried on in Vermont, at Washington, D. C., in South Carolina and in Texas, where areas of land of from four to twenty acres are reserved for use in this connection.

In South Carolina experiments on a commercial scale are in progress, several thousand pounds of drugs having been marketed last fall.

The laboratory investigations are carried on chiefly at Washington in three laboratories: the laboratory of histology, where questions of structural and plant physiological nature are under investigation; the laboratory of phar-

macognosy, where the study of improved processes of handling the products is given especial attention; and in cooperation with poisonous plant investigations, laboratory of pharmacology, where the physiological action of drug plants and products is tested. In addition to these laboratories, for all routine chemical work, cooperation with the bureau of chemistry is afforded.

Among the problems under investigation are, first, the domestication and cultivation of valuable native drug plants now being depleted, such as hydrastis and cascara sagrada; second, the cultivation of drug plants furnishing products now exclusively or chiefly produced abroad and imported, as, for example, belladonna, licorice, capsicum, opium poppy and many others; third, a careful scientific study of processes involved in curing and fermentation or in otherwise treating the fresh material in order to bring it in best condition to the market.

Do Segregations of Character Pairs Occur at Other Points in the Development of Organisms than the Maturation of Germ Cells: Professor W. J. Spillman.

The speaker pointed out that the distribution of color on spotted animals could be explained on the assumption that the color potentialities separate in cell divisions concerned only in the somatic development of the animal, and that bud variation might possibly be due to the same thing. If such separations do occur, very distinct cases of mutation might arise in consequence thereof. In this connection it is interesting to note the conclusions of biologists who have investigated the subject of embryology. They conclude that in some embryos the cells resulting from the first one or two divisions in the embryo have almost identically the same inheritance, and that a single one of these cells is capable of developing into a complete embryo, usually, however, dwarfed in character. In other embryos, if one of the two cells resulting from the first division is destroyed, the other cell develops into a portion of the embryo, presumably that portion that would have developed from that cell if the other cell had lived, indicating that in the first division a separation of characters was made that gave the two cells a different inheritance.

H. J. Webber,
Corresponding Secretary.

The Chemical Society of Washington.

The 155th regular and twenty-first annual meeting of the society was held Thursday evening, January 12, in the assembly hall of the Cosmos Club. The business of the evening consisted in the presentation of the annual reports of the secretary and treasurer and of the election of officers for the ensuing year. The election resulted as follows:

President—S. S. Voorhees.
First Vice-President—L. M. Tolman.
Second Vice-President—Allan Wade Dow.
Secretary—Atherton Seidell.
Treasurer—Fred. P. Dewey.
Four additional members of the Executive Committee—Messrs. E. T. Allen, Frank K. Cameron, Edwin A. Hill and L. S. Munson.

Professor F. W. Clarke was nominated on behalf of the Chemical Society as vice-president of the Washington Academy of Sciences.

At the conclusion of the election of officers, Dr. W. A. Noyes, of the National Bureau of Standards, delivered an address upon 'The Work of the Bureau of Standards.'

A. Seidell,
Secretary.

The American Chemical Society. Northeastern Section.

The fifty-sixth regular meeting of the section was held Friday evening, December 16, in the Lowell building, Massachusetts Institute of Technology, with President Norris in the chair. About 150 members and guests were present.

Professor Edwin J. Bartlett, of Dartmouth College, gave an address entitled 'An Evening with the Alchemists,' in which he described the processes and apparatus used by the alchemists, and showed a large number of lantern slides of contemporaneous pictures of alchemical utensils and interiors of the laboratories of the middle ages.

Arthur M. Comey,
Secretary.

THE WISCONSIN ACADEMY OF SCIENCES, ARTS AND LETTERS.

THE thirty-fifth annual meeting of the academy was held at Milwaukee, December 28 and 29. The program contained twenty-six titles as follows:

JAMES DAVIE BUTLER: 'Charles Kendall Adams—His Place in Three Universities.'

C. S. SLICHTER: 'The Specific Capacity of Wells.' (By title.)

J. H. FARLEY: 'The Concept of Motion.'

J. S. ROESELER: 'The Present Status of the Wisconsin Industrial School for Boys—Its Mechanism and Methods.'

E. B. SKINNER: 'The Determination of the Value of the Right of Way for Wisconsin Railroads.'

E. B. HUTCHINS, JR.: 'A Contribution to the Chemistry of the Tellurates.'

F. L. SHINN: 'On the Electrical Conductivity of Vapors.' (By title.)

LOUIS KAHLENBERG and HERMAN SCHLUNDT: 'On the Evolution of Hydrogen During the Action of Sodium on Mercury.'

LOUIS KAHLENBERG: 'On the Measurement of Osmotic Pressures.'

EDWARD KREMERS: 'On Classification of Carbon Compounds, II.'

WM. H. HOBBS: 'Some Examples of Fault Networks.'

DR. SIGMUND GRAENICHER: 'The Relations of the Andrenine Bees to the Entomophilous Flora of Milwaukee County.'

R. H. DENNISTON: 'The *Russulas* of Madison and Vicinity.'

GEORGE M. REED: 'Infection Experiments with *Erysiphe Graminis*.'

VALENTINE FERNEKES and C. E. BROWN: 'The Fungi of Milwaukee County and Vicinity.' (By title.)

R. A. HARPER: 'Spore Formation in *Cordyceps Herculea* Schw.'

S. P. NICHOLS: 'The Nature and Origin of the Binucleated Cells in Certain *Basidiomycetes*.'

A. H. CHRISTMAN: 'Observation on the Wintering of the Grain Rusts in Wisconsin.'

W. D. FROST and E. V. MCCOMB: 'Soil Bacteria in the Vicinity of Madison.'

W. D. FROST, C. G. DAVIES and H. F. HELMHOLTZ: 'The Viability of *Bacterium Diphtheriæ*.'

GEORGE W. and ELIZABETH G. PECKHAM: 'The *Attidæ* of Borneo.' (By title.)

W. S. MARSHALL: 'Experiments with Caddisfly Larvæ.'

GEORGE WAGNER: 'Notes on the Behavior of *Physa Ancillaria*.'

M. V. O'SHEA: 'The Psychology of Linguistic Development in the Individual.'

C. E. BROWN: 'The Fluted Stone Axes of Wisconsin.'

A. G. LAIRD: 'The Greek and Persian Armies at Thermopylæ.' (By title.)

The attendance was not large, but the sessions were marked by strong interest on the part of all present, and the papers were, as a rule, freely discussed.

The meeting was noteworthy on account of the inception of plans for strengthening the work of the academy. Steps were taken looking toward the publication of the *Transactions* in series instead of in a single volume of two parts as heretofore. A committee was appointed to see what may be done in the way of increasing the exchange list and filling gaps in the library. Five hundred dollars were appropriated for the work of this committee. The academy has already a valuable library, consisting almost entirely of transactions of learned societies from all parts of the world.

Part 2 of Vol. XIV. of the *Transactions* was issued in September, 1904.

E. B. SKINNER,
Secretary.

THE SCIENCE CLUB OF THE UNIVERSITY OF WISCONSIN.

THE fourth meeting of the club for the year 1904–05, was held on January 24. The following papers made up the program of the evening:

The Panama Canal—a symposium:
F. E. TURNEAURE: 'Engineering Features.'
W. A. SCOTT: 'The Economic Aspects.'
W. D. FROST: 'The Hygienic Problems.'

F. W. WOLL,
Secretary.

THE ELISHA MITCHELL SCIENTIFIC SOCIETY.

THE 157th meeting of the Elisha Mitchell Scientific Society of the University of North Carolina was held in the chemical lecture

room, Tuesday, January 10, 7:30 P.M., the following program being rendered:

PROFESSOR WILLIAM CAIN: 'The Theory of Metal or Reinforced Concrete Domes.'

PROFESSOR J. H. PRATT: 'Steel Hardening Metals.'

ALVIN S. WHEELER,
Recording Secretary.

DISCUSSION AND CORRESPONDENCE.

THE BITING POSITION OF ANOPHELES.

IT is a curious fact, as shown by Dr. J. B. Smith's communication in SCIENCE for January 13, 1905, that no observer, from the number cited, has noted the exact position of this mosquito when biting. The writer, in his communication in the December 2, 1904, issue, based his statement upon observations made in 1903 in the northern woods of Minnesota, where a number of individuals of *A. maculipennis* were allowed to fill themselves with blood from the hand, in an endeavor to see how long a time was required by them to digest a full meal (page 170 Eighth Annual Report of the State Entomologist of Minnesota). As I recall the experiment, my impression is that these mosquitoes, when biting, took a position somewhat resembling their resting position, with body and beak more nearly in line, and not at right angles as seen in *Culex*. I shall have to include myself in the army of non-observants to the extent of saying that I am not absolutely sure of this. This was made clear in my communication on page 170 of the issue of SCIENCE referred to, where I said, 'While we may be mistaken, we are under the impression that this genus, in biting, etc.' As Dr. Smith very rightly says in his letter 'I do not understand him (Washburn) to say positively that the figure is inaccurate, only that it had been his belief that the biting position resembled the resting position more nearly.'

As I remember the chart at St. Louis taken from an illustration of Nuttall & Shipley, the biting *Anopheles* is shown with body horizontal. This may be correct, but I note that Dr. Herbert Johnson, who worked on *Anopheles* for Dr. Smith, and who is quoted in the latter's communication, says with reference to the position of the body of *Anopheles* when biting, 'It is always somewhat oblique.' It was, I believe, this horizontal position with beak at right angles, which caught my eye in looking at Dr. Smith's most complete and excellent exhibit.

At the same time it will possibly occur to many that there may be individual variations in the position of biting mosquitoes, due to different configurations, greater or smaller, of the surface at the immediate point where the insect is working. The time is not far distant when this feature in the activities of *Anopheles* can be put beyond question. In the meantime it is to be hoped that some more observant workers, following Dr. Smith's suggestion, will let us hear from them on this point.

F. L. WASHBURN.

MINNESOTA STATE EXPERIMENT STATION,
January 19, 1905.

UNIVERSITY REGISTRATION STATISTICS.

TO THE EDITOR OF SCIENCE: The registrar of the University of Wisconsin has called my attention to a discrepancy that occurs in the figures furnished by him for the article on 'University Registration Statistics,' published in SCIENCE, December 30, 1904. In former years the short course and dairy students, who do not enter the university until December 1, were reported, whereas they were not included in the 1904 table. Four hundred and thirty-nine short course and dairy students were enrolled on December 1, 1904, and inasmuch as none attended the summer session of 1904, 439 should have been added to the total, giving a grand total for the University of Wisconsin of 3,370 instead of 2,931, and consequently showing a normal increase instead of the decrease represented by the figures in the table. These additional students were reported a fortnight after the appearance of the article, but it seems only fair to call attention to the omission.

RUDOLF TOMBO, JR.

SPECIAL ARTICLES.

GENERIC NAMES OF SOFT-SHELLED TURTLES.

IN a recent paper 'On the Existing Genera of the Trionychidæ' (*Proc. Amer. Philos.*

Soc., XLII., pp. 268–274) Dr. O. P. Hay, among other questions, endeavors to show that Wagler's *Aspidonectes* must stand for the large genus of soft-shelled turtles typified by the species *Testudo triunguis*, and that *Amyda* must be regarded as a synonym of the former. As I shall show below, the case must be reversed so that *Aspidonectes* becomes a synonym of *Amyda*.

Dr. Hay proceeds from the assumption that Wagler (1830) was the first author to subdivide the genus *Trionyx*, and if that were the case his reasoning would undoubtedly hold good. Unfortunately the subdivision was undertaken as early as 1816 by Oken. In his 'Lehrbuch der Zoologie,' volume II., p. 348, the latter divided the genus in two, one containing the majority of the species, which he called *Amyda*, and one for the single species *T. granosus*, which he expressly calls *Trionyx granosus*, thus evidently reserving the generic term *Trionyx* in a restricted sense for this species. He thus anticipated Wagler by fourteen years in limiting *Trionyx* to the genus which afterwards has been currently known as *Emyda*. The part of Dr. Hay's argument which relates to the latter is, therefore, not affected by Oken's action. But *Amyda* and *Aspidonectes* are not exactly coextensive, inasmuch as Oken does not definitely place *T. subplanus* in either of the two genera, being uncertain as to its affinities and referring to it both as *Amyda subplana* and as *Trionyx subplanus*. Consequently it can not with any show of reason be made the type of any of these genera.

The next man to adopt Oken's name *Amyda* was Fitzinger, who in 1835* restricted it to three species, viz., *T. subplanus*, *T. muticus* and *T. euphraticus*. As shown above, *T. subplanus* can not be Oken's type, neither can *T. muticus*, which was described long after Oken. There remains consequently for type *T. euphraticus*.

It thus becomes unnecessary to discuss Bonaparte's subsequent employment of *Amyda* in 1836, but it may not be out of the way to observe that his arrangement can not be made to differ from Fitzinger's of the previous year, inasmuch as it is a paraphrase pure and simple of this author using his characters verbatim and quoting all the subgeneric names as '*Aspidonectes*, Fitz.,' '*Platypeltis*, Fitz.,' '*Pelodiscus*, Fitz.,' and '*Amyda*, Fitz.,' the only difference being that Bonaparte does not mention more than one of the species Fitzinger included.

As Dr. Hay has clearly shown, the type of Wagler's *Aspidonectes* by elimination is *A. triunguis*. He does not mention in his article in which genus he would place *T. euphraticus*, but I think there can be but little doubt that the two species are strictly congeneric, and that consequently *Aspidonectes* becomes a synonym of *Amyda*.

If *T. subplanus* is generically distinct it must retain the name *Dogania* given it by Gray in 1844. Dr. Hay considers it congeneric with *Aspidonectes* (now *Amyda*), but I wish to call attention to the fact that it is not only unique in having all the pleuralia separated by the neuralia, but also in lacking the median process of the hypoplastron, as shown recently by Dr. Siebenrock. Altogether it possesses so many peculiar characters that it seems more worthy of separation than the North American species which Dr. Hay would recognize as *Platypeltis*.

LEONHARD STEJNEGER.
U. S. NATIONAL MUSEUM,
January 19, 1905.

* There is no reason for quoting his paper in the first volume of *Annalen des Wiener Museums* from 1836. It was certainly published before Bonaparte's 'Tabula analytica,' as he quotes Fitzinger throughout.

A NEW FIELD FOR LANGUAGE STUDY.

THE latest form of instrument in which a spoken language is magnetically recorded in a steel piano wire, was shown to the members of Section B at the recent meeting of the American Association for the Advancement of Science at Philadelphia. The wire is carried on two spools driven electrically, and can be reeled from either to the other. During this operation the wire passes between the poles of a small magnet, and by magneto-induction the spoken words are reproduced in the receiving instrument. If the motion of the wire is direct you hear the words as they

are ordinarily heard in conversation. If the wire is reversed, you hear the same sounds presented in reverse order. You hear what you would hear if you were to follow the sound waves after they have passed the ear, traveling through them in a radial direction with twice the velocity of sound. The reversed words are perfectly definite in character, and constitute a new language related in a simple mathematical way to that originally spoken. One might learn to pronounce a sentence of this language, thus derived from an English sentence, impress it upon a fresh wire, and the instrument on reversal would translate it into English. This new language might be called the Hsilgne. It is related to the English language in a way that may be roughly represented by the equation

$$\text{Hsilgne} = \text{English} \times \cos 180°.$$

This word forming the first member of the equation is not the English spelling of the word English when pronounced backwards. In order to properly typify the relation between the two languages, not only should the order of the letters be reversed, but each letter should be reversed as to right and left, as when the word is seen by reflection from a mirror.

The ear may, however, be supposed to traverse the system of sound waves produced by an orator, in any one of an infinite variety of directions. The path traversed by the ear, and a radial line drawn to the mouth of the speaker, may make any angle a between 0° and 180°. If the velocity of the ear be correspondingly varied, we shall have in the above case a great spectrum of languages lying between Hsilgne and English. The variable language will in general be represented by the equation

$$\text{Language X} = \text{English} \times \cos a.$$

As the angle a approaches 90°, the variable language becomes more barbarous and inarticulate. When $a = 90°$, the ear would be moving parallel to the wave fronts, and nothing would be heard. The conditions realized are analogous to those which hold in a photographic plate when the fog line is approached, separating the negative from the positive picture. It would be very interesting to determine whether there is any radical difference between the positives and the corresponding negatives of a spoken language. Each language, corresponding to a given value of a with English as a base, would have a corresponding negative, where the angle is $a + 180$. The Poulsen instrument is now perfectly adapted to the study of the relation of any language to its negative, if either be placed on record in the wire. Of course in such a reversal as the Poulsen instrument gives, the grammatical construction is also reversed. Some of the difficulties that would be met in learning to talk Hsilgne can be realized by reading this communication backwards, beginning with the last word and ending with the first. In such a reading the words themselves are not reversed, but the order in which they are presented to the ear is that which would hold in the negative language.

Francis E. Nipher.

QUOTATIONS.

SALARIES AT HARVARD UNIVERSITY.

Speaking roughly, the rule may be said to be that a full professor in Harvard College receives $4,000 a year, an associate professor $3,000, an assistant professor $2,000, an instructor $1,000, and an assistant from $250 to $400. In the last academic year there were in the college 51 full professors, 2 associate professors, 38 assistant professors, 7 lecturers, 1 tutor, 88 instructors, and 87 assistants. Of the professors, 14 received $5,000; 1, $3,600; 10, $3,500; 3, $3,000; 4, $2,000; and 1, $1,000. This showed a total item of salaries of about $227,000. The actual average, based on the exact figures, which are not those given here, was $3,984, which confirms the impression that the Harvard professor is a $4,000 man.

The incomes of the other classes of instructors show similar variations. The two associate professors receive $3,500; but salaries of the assistant professors range from $3,000 down to $500; the average being $2,160. The lecturers average $781 each, while the compensation of instructors ranges from $2,000 to $100, with an average of $999. The assistants

receive anywhere from $1,200 down to $20, the average last year being $328; thus it is seen that a large part of the teaching force of Harvard College is composed of men who receive salaries that would not tempt men to become conductors and motormen on a street railway, and Harvard (*miserabile dictu*) is probably better off than any other American college.

These salaries from the point of view of prosperous Harvard graduates are positively startling, especially if one considers the kind of people with whom a teacher necessarily rubs elbows, if he holds a position in the service of a college. Of course, men don't teach at Harvard or at any other American college of high standing for the mere sake of money. Anybody who is competent to be a full professor at Harvard is capable of securing several times the income of his professorship in some other line of work. The list of teachers contains the names of countless men of world-wide reputation, who by merely signifying that they would accept better positions could step at once into places with a pecuniary return of three, four or even five times what they now obtain.

As has been said, it is probably true that in Colonial days the Harvard teacher was virtually on a financial level with the successful lawyer and the prosperous butcher or baker, as to-day he certainly is not. Until recently, too, the level of salaries in Harvard college rose somewhat rapidly from generation to generation, though never keeping pace with the advances in the emolument of the other professions and trades which college graduates enter.—The New York *Evening Post*.

CURRENT NOTES ON METEOROLOGY.

KITE METEOROLOGY OVER LAKE CONSTANCE.

IN a recent note under the above heading, reference was made to the observations carried on by Dr. Hergesell 'during the years 1900, 1902 and 1903' on the Lake of Constance. The compiler of these 'Notes' desires to correct that statement, for the reason that no observations were made in 1900. The following quotation from Dr. Hergesell's report to the International Meteorological Committee in 1903 makes the situation clear: "In July, 1900, I had the idea of using the speed of a boat to correct the wind conditions, and I made some experiments with a motor boat (on the Lake of Constance), but without raising an instrument. In the month of August, 1901, Mr. Rotch, in America, was the first to lift an instrument in nearly calm weather by using a steamboat which he could manœuver at will. The proposal of Mr. Rotch * * * led me to recommence my experiments on the Lake of Constance (in June, 1902)."

WIND CHARTS OF THE SOUTH ATLANTIC.

THE Hydrographic Department of the British Admiralty has recently published a volume of monthly wind charts of the South Atlantic Ocean, prepared by the marine branch of the Meteorological Office. The region embraced by these charts extends from the equator to latitude 65° south. Nearly a million sets of observations were used in the compilation. The results are shown by means of wind roses in 5° squares. Isobars and isotherms are also drawn, and numerous notes concerning the climatic features along the coast of Africa and of South America are included. It may here be noted that fogs seldom occur north of latitude 30° except near land, and that the southwestern part of the ocean is the only region in which ice is ordinarily found.

SUNSPOTS AND RAINFALL.

MR. H. I. JENSEN, of Sydney, New South Wales, discusses the relations between solar and terrestrial phenomena in the *Proceedings of the Royal Society of New South Wales*, Vol. 38. In general the author agrees with the results obtained by Sir Norman and Dr. W. J. S. Lockyer regarding the connection existing between solar and meteorological variations, but he inclines to the opinion that the epochs of sun-spot maxima are generally the periods of excessive rainfall. One point—an important one—upon which Mr. Jensen insists is the need of laying more emphasis upon geographical position when the meteorological conditions of any place are considered.

NOTES.

Mons. J. Vallot has recently sent to his correspondents a reprint from the *Revue Illustrée* for July 1, 1904, containing a fully illustrated account of his scientific work on Mont Blanc, with views of his meteorological observatories, and a bibliography of his publications.

A relation between sunspots and thunderstorm frequency at Vienna is set forth by G. Walter, in *Das Wetter* for December, 1904. The author believes that a year with few thunderstorms almost always precedes a year of sun-spot maximum. These results do not agree with those obtained some years ago by von Bezold; in fact, there is a very considerable diversity of opinion in regard to almost all the relations between solar and meteorological phenomena. R. DeC. Ward.

EUGENE G. BLACKFORD.

Eugene G. Blackford, who died recently, was known to American zoologists for his many-sided and practical contributions to the study of fish and shell-fish. He was for a long time associated with the United States Commission of Fisheries, and was a supporter of Professor Baird in his efforts to create the national commission: he was Commissioner of Fish and Fisheries of the State of New York from 1879 to 1892, and it was under his administration that many measures were taken with regard to the stocking of waters and the protection of fish. The survey and renting of the state oyster-grounds, it may be mentioned, was due to his initiative. He devoted himself particularly to applying scientific results to practical purposes, and his efforts in promoting fish-hatching, in introducing new and serviceable species of fish, in stocking waters, and in devising new methods for catching, preserving, shipping, and storing fish, had a permanent effect upon the markets of the country; he frequently brought to the consumer fish which were new to him, sometimes even new to science, such, for example, was the red snapper, *Lutjanus blackfordi*. In 1881 he was instrumental in founding the state fish hatchery at Cold Spring Harbor; in 1890 he established there, under the auspices of the Brooklyn Institute of Arts and Sciences, a biological station, which developed successfully and has recently been adopted by the Carnegie Institution. As early as 1877* he mooted the establishment of a New York aquarium and he later designated the Battery building as a suitable nidus for its growth. He was the first, as far as I am aware, to make this practical suggestion, and to his efforts and influence no small part of the success is due in creating the present institution. He was most influential in supporting the establishment of the museum of the Brooklyn Institute of Arts and Sciences, and in the latest time he took a prominent part in creating in Brooklyn a teaching museum for children.

The following are the more important of Mr. Blackford's publications:

1876. 'On the Need to Obtain Statistical Studies of Fish Catches in the United States.' *Report of American Fish Culturists' Association*, V. meeting, p. 5.

1877. 'Reference to the Length of Time Milt of Salmon Could be Kept Successfully.' *Ibid.*, VI. meeting, p. 99.

1877. 'Introduction of Pompano into the Northern Markets.' *Ibid.*, p. 124.

1878. 'Peculiar Features of the Fish Market.' *Ibid.*, VII. meeting, p. 77.

1879. 'Whitebait in American Waters.' *Ibid.*, VIII. meeting, p. 11.

1882. 'Report on the Merits of the Rainbow Trout.' *Ibid.*, XI. meeting, p. 23.

1883. 'On the Size of Marketable Lobsters.' *Ibid.*, XII. meeting, p. 414.

1883. 'A Few Facts in Relation to the Food and Spawning Season of Fishes on the Atlantic Coast.' *Ibid.*, XIII. meeting, p. 5.

1883. 'Regarding the Pollution of the Water of New York Bay.' *Ibid.*, p. 73.

1884. 'Is Legislation Necessary for the Propagation of the Ocean Fisheries.' *Ibid.*, XIII. meeting, p. 60.

* He referred to the 'necessity of an aquarium in New York City'; and he expressed the hope 'that a public enterprise might be started which would be a free public institution.' 'Report of the Am. Fish Culturists' Association,' 1877, p. 107.

1885. 'The Oyster Beds of New York.' *Ibid.*, XIV. meeting, p. 85.

1885. 'Report of the Commissioner of Fisheries of the State of New York in Charge of Oyster Industry,' pp. 70.

1886. *Ibid.*, II. report, pp. 23.

1886. 'Report of the Commissioner of Fisheries of the State of New York.' XIV. report, p. 7.

1887. *Ibid.*, 'Oyster Industry.' III. report, pp. 27.

1887. *Ibid.*, XV. report, pp. 17.

1888. *Ibid.*, XVI. report, pp. 30.

1899. 'On the Spawning Season of the Eel.' SCIENCE, N. S., Vol. IX., p. 741.

BASHFORD DEAN.

COLUMBIA UNIVERSITY,
January 25, 1905.

ILLINOIS RIVER PLANKTON.

THE Illinois State Laboratory of Natural History has published, as Article II. of the sixth volume of its Bulletin, a report on the results of a virtually continuous study of the minute plant and animal life, or plankton, of the Illinois River and its tributary waters, carried on for five successive years by the staff of the Illinois Biological Station. This makes a volume of 534 pages, illustrated by 2 maps, 11 half-tone plates, and 37 full-page diagrams.

Opening with an elaborate description of the Illinois River and its drainage basin, this report treats of the effect of variations of temperature and peculiarities of chemical condition on the life of the stream, and presents at length and in detail a comparative study of 630 plankton collections made from the river at Havana, from one of its tributaries which empties into it at that point, and from five bottom-land lakes of various character and variously related to the main stream. These collections were so made, at regular intervals, with identical apparatus, and by a uniform method, that they can be compared with each other quantitatively, and may be used as the basis of general conclusions concerning the system of minute life in these waters, from season to season and from year to year.

It appears from these studies that the plankton is distributed in the main stream of the Illinois River about as evenly as it is in the stationary waters of a lake, and that generalizations based on an examination of a small part of it are consequently as reliable as those concerning that of a lake. The ratio of the plankton of the river, year in and year out, was 2.7 parts per million of the water in the stream, and its total average amount moving down stream past any given point reached the astounding aggregate of 75,000 tons per annum, or 8.5 tons an hour. This is about 15 times the total weight of the fish taken from the river in a year.

The production of the plankton falls to its minimum, as a rule, in January and February, and reaches its maximum in April, May, and June. Floods, of course, dilute it, and falling waters concentrate it, but, on the other hand, a season of general high water increases its total quantity, and a season of general low water decreases it. Light and heat favor its development, and it is consequently more abundant, other things being equal, in a season during which clear and warm weather preponderates than in a cold and cloudy one. The freezing of the river does not seriously affect it, unless the ice-sheet continues until the water becomes foul with the gases of decay. The addition of sewage to the river water greatly increases the production of this minute life by increasing the supply of available food, although an excessive amount of sewage may render the water too foul for it at the point of discharge.

The production of plankton is less in short streams with relatively swift current than in long streams with slow current, and short tributaries consequently tend to dilute the plankton of the main stream. On the other hand, the stagnant and relatively permanent waters of shallow lakes bear a more abundant plankton than the temporary waters of flowing streams, and the outflow from such lakes hence enriches the plankton of the river. Parts of a stream with many small tributaries will contain less plankton than those with which numerous lakes are connected.

The bottom-land lakes differ widely in the amount of plankton which they contain, this

being least in those with an abundance of coarse submerged water plants, and greatest in those virtually free from such vegetation. The reasons for this difference seem not well established in this paper, but they are possibly connected with differences of light and heat already referred to. The most productive body of water examined was a large permanent pond, with neither inlet nor outlet at a low stage of water, and with bottom and shores of bare mud.

The conditions which favor a large annual production of this minute aquatic life also seem to favor a large catch of fish, but no direct connection of cause and effect is here made out. The plankton is, however, an indispensable element in the food of fishes, the young of nearly every species in our waters being absolutely dependent upon it at some period of their lives, and adult fishes of several species making large use of it during the season of its greatest abundance.

No study of the minute life of a river system has heretofore been made of equal extent, thoroughness, and scientific character with that reported in this paper, and a knowledge of the facts contained in it is indispensable to an understanding of some of the problems of a scientific fish-culture in fresh-water situations.

The work here reported is a part of that of the biological survey of Illinois. It was planned, established, and equipped by Dr. S. A. Forbes, director of the State Laboratory, and was done under the immediate superintendence of Professor Frank Smith, of the University of Illinois, during the first fifteen months, beginning with April, 1894, and of Dr. C. A. Kofoid, superintendent of the station, the writer of this report, during the remainder of the five-year period.

THE MISSOURI BOTANICAL GARDEN REPORT.

Advance galleys of the administration report of this well-known institution, for which we are indebted to its director, show the customary progress. In 1904 the number of species and varieties of plants cultivated was increased from 11,357 to 14,207, an addition of 25 per cent. The herbarium was enlarged from 465,205 to 489,310 specimens, an increase of a little over 5 per cent., and the total of books and pamphlets in the library was raised from 42,262 to 45,892, or something over 8 per cent.

The world's fair recently held in St. Louis raised the visitors to the garden to over three times the customary number, a total of 316,747, or about 2 per cent. of the entire paid admissions to the exposition. That these visitors were of an unusually intelligent and interested class is noted from observation and inferred from their purchase of a little handbook of the garden, the sales of which amounted to 1.51 per cent. of the number of visitors in contrast with an earlier average of .246 of 1 per cent.

The report also contains information as to the school of botany, the gardening course, the research work at the garden and the testamentary flower sermon, banquets, and flower show, all of which latter were influenced by the holding of the St. Louis exposition, at which the garden met with recognition in the form of two grand prizes and several minor awards.

The financial report of the trustees shows that street improvements, sewers, property expenses and the like have wiped out their savings of the past fifteen years, on which needed buildings and enlargements have been planned by the director, and it is evident that unless unexpected aid is rendered the garden by some public-spirited citizen these improvements must necessarily be deferred for at least ten years, although the maintenance of the establishment on its present scale is not in doubt, and there is assurance in its unencumbered endowment of some $3,000,000 that gradually it will enlarge to an importance and usefulness equaling the most sanguine expectations of its friends.

THE NATIONAL GEOGRAPHIC SOCIETY.

Professor Willis L. Moore, chief of the U. S. Weather Bureau, was elected president of the National Geographic Society, at the last meeting of the board of managers, at Washington. Professor Moore has been ac-

tively identified with the society for many years and has served on the board of managers since 1897. At the same meeting Mr. Henry Gannett, chief geographer of the U. S. Geological Survey was elected vice-president of the society. Mr. Gannett was one of the incorporators of the society in 1888, and has served continuously on the board since that date. At the same meeting Hon. O. P. Austin, chief of the Bureau of Statistics, was elected secretary, Mr. John Joy Edson, president of the Washington Loan and Trust Co., was elected treasurer; Gilbert H. Grosvenor, editor; and Miss Eliza R. Scidmore, foreign secretary.

The society is now entering upon its eighteenth year. It has a total membership of 3,400, of whom 1,125 are residents of Washington, and 2,275 distributed throughout every state in the union and in nearly every country in the world. Its object is the increase and diffusion of geographic knowledge which it accomplishes:

1. Encouraging worthy plans for exploration. The society has sent one expedition to Alaska, another to Mont Pelée, Martinique, and La Souffrière, St. Vincent, and has been associated with several Arctic and other expeditions. At present its representative has direction of the scientific work of the Ziegler Polar Expedition, and is second in command.

2. By publishing an illustrated monthly magazine, the *National Geographic Magazine* and many large maps.

3. By an annual series of thirty addresses delivered in Washington by prominent men. The speakers this year have included Hon. John W. Foster, Wm. E. Curtis, Baron Kentaro Kaneko. Charles Emory Smith, F. H. Newell, Gifford Pinchot, G. K. Gilbert, etc.

4. By the maintenance of a library.

The society has now been established in its handsome new home, Hubbard Memorial Hall, for nearly a year. It was erected as a memorial to the first president of the society by the family of Mr. Hubbard.

SCIENTIFIC NOTES AND NEWS.

AFTER twenty years of service as United States commissioner of labor, Dr. Carroll D. Wright retired from that office on January 31, and went to Worcester, Mass., to assume the presidency of Clark College. His successor, Dr. Charles P. Neill, took charge of the Bureau of Labor on February 1.

FISH COMMISSIONER GEORGE M. BOWERS has been notified of President Roosevelt's desire that he remain at the head of the Bureau of Fisheries during the next administration. The president has several times expressed his approval of the manner in which the affairs of the bureau were being conducted, and it is reported that he recently reiterated his satisfaction, remarking that all he asked for the next four years was a continuance of the energetic and zealous work which has characterized Commissioner Bowers's seven years of service.

PROFESSOR A. AUWERS, the eminent astronomer of Berlin, has been elected an honorary member of the St. Petersburg Academy of Sciences.

THE cross of officer of the Legion of Honor has been conferred by the French government on Dr. Otto Nordenskjöld for his South Polar explorations.

THE Société Nationale d'Agriculture de France has awarded to Professor Wm. B. Alwood, of Charlottesville, Va., a diploma and silver medal for his recent work in pomology, especially as relates to the fermentation of by-products from apples. A gold medal was also awarded the exhibit on Œnological Technology prepared by Professor Alwood for the St. Louis Exposition.

MR. N. H. DARTON, of the U. S. Geological Survey, has been awarded a gold medal for his geological model of the Black Hills, exhibited by the South Dakota Commission at their section in the Mines and Mining building, at the St. Louis Exposition.

DR. G. B. HALSTED'S 'Rational Geometry,' reviewed in SCIENCE last week, is being translated into French by Professor C. Barbarin, president of the Société des sciences physiques et naturelles de Bordeaux. His address on the 'Message of the Non-Euclidean Geometry,' given as vice-president of the American

Association last year, will be translated into Japanese by Yoshio Mikami.

Dr. N. L. Britton, of the New York Botanical Garden, accompanied by Mrs. Britton and Dr. Marshall A. Howe, of the garden, and Dr. C. F. Millspaugh, of the Field Columbian Museum, are at present conducting botanical explorations in the Bahamas. They expect to return at the end of the month.

Dr. L. A. Bauer left for Europe on February 1, to be gone five weeks on business connected with the department of terrestrial magnetism of the Carnegie Institution.

Assistant Professor Harry G. Wells, of the department of pathology and bacteriology, of the University of Chicago, is spending a year in Europe in the study of physiological and pathological chemistry. He is at present in Berlin.

Miss Clara E. Cummings, professor of botany at Wellesley College, sailed on February 1, for Jamaica, where she will spend several months in the study of the flora—particularly the lichens. Part of the time will be spent at the laboratory at Cinchona maintained by the New York Botanical Garden.

During holiday week Professors Gould and Woodruff, of the Department of Geology, University of Oklahoma, conducted a fossil collecting party into the Arbuckle Mountains of Indian Territory. The party secured about 2,000 specimens, among which are a large number of rare *Camerocrinus*. Most of these will be for exchange.

Mr. Chas. T. Brues, now with the Bureau of Entomology of the U. S. Department of Agriculture, has been appointed curator of invertebrate zoology in the Milwaukee Public Museum. Mr. Brues's address will change from Washington to Milwaukee on March 1.

Dr. Emanuel Kusy, Ritter von Dubrav, has been appointed head of the sanitary department of the Austrian Ministry of the Interior.

Mr. R. H. Lock has been appointed assistant curator of the herbarium at Cambridge University, succeeding Mr. Yapp, who was some time ago elected professor of botany at Aberystwyth.

Mr. Bailey Willis, of the U. S. Geological Survey, delivered two lectures at the Johns Hopkins University on January 18 and 19 on the results of his recent work in China under the auspices of the Carnegie Institution. Professor Wm. M. Davis, of Harvard University, will give in February a course of sixteen lectures on geographic subjects to the students of the geological department.

The following members of the assay commission, named by the President and Secretary of the Treasury for 1905, will meet in Philadelphia on February 8 to test the reserved coins of the various mints for the year 1904: Hon. Ellis H. Roberts, treasurer of the United States; Hon. W. B. Ridgely, comptroller of currency; Hon. J. H. Southard, M.C.; Hon. J. B. McPherson, judge, Eastern District of Pennsylvania; Dr. Herbert Torrey, U. S. Assay Office, New York; Milo M. Potter, Los Angeles, California; O. W. Thompson, Vermillion, South Dakota; Benjamin S. Hanchett, Grand Rapids, Michigan; Hon. Warren Truitt, Moscow, Idaho; Charles S. Winslow, Chicago; W. A. Blair, Winston-Salem, N. C.; Col. E. R. Sharp, Columbus, O.; L. A. Fisher, Bureau of Standards, Washington; Dr. John A. Mathews, Syracuse, N. Y.; Dr. Francis H. Smith, University of Virginia; Dr. Leonard P. Kinnicut, Worcester Polytechnic Institute; Dr. Edgar F. Smith, University of Pennsylvania; John Birkinbine, Philadelphia; Edward F. Stotesbury, Philadelphia; and W. H. Anderson, Grand Rapids.

Nature states that Sir James Dewar has presented the proceeds of the Gunning prize, amounting to one hundred guineas, recently awarded to him by the Royal Society of Edinburgh, as a contribution to the fund for the encouragement of research, now being founded in the University of Edinburgh in memory of the late Professor Tait.

Mr. William Sellers, well known as a mechanical engineer and manufacturer of machine tools, has died at Philadelphia, at the age of eighty-one years. Mr. Sellers was a member of the National Academy of Sciences and of the American Association for the Advancement of Science.

M. PAUL HENRY, the French astronomer, died on January 4, as a result, it is said, of cold in the Alpine Observatory on Grand-Montrouge. This was also the cause of the death of his brother, Prosper, who died in 1903. The brothers are well known for the work that they carried on together in astronomical photography especially in connection with the great international chart of the heavens.

PROFESSOR ERNST ABBE, of Jena, well known for his important improvements in the microscope and other optical instruments, which he constructed in partnership with Karl Zeiss, died on January 16, at the age of sixty-four years.

MR. THOMAS W. SHORE, a British geologist and archeologist, died on January 15.

MR. J. M. BACON, known for work in astronomy, acoustics and meteorology, and especially for his balloon ascents, died on December 25, at the age of fifty-eight years.

THE Department of Health of New York City has decided to establish a research laboratory in the new laboratory building which is being erected.

THE budget of the ministry of the interior of the German empire includes an item of $37,500 for research work on tuberculosis.

THE restored pterodactyl, with a spread of wings of twelve feet, first exhibited at the St. Louis exposition, has been set up for exhibition in Peabody Museum of Yale University.

Bird-Lore for February contains the annual report of the National Committee of Audubon Societies, a document of some eighty pages. The report summarizes the history of the Audubon movement and gives most encouraging details of the year's progress. Societies are now established in thirty-five states, and a model bird law has been passed in twenty-eight states. Thirty-four wardens to guard colonies of nesting birds are employed, and the societies cooperate with national and state game officials. President Roosevelt, who is in hearty sympathy with Audubon work, has set aside certain government lands as perpetual breeding places for birds, and the Lighthouse Board has lent its powerful aid in protecting sea-birds along the coast. The National Committee, which acts as an executive body for all the state societies, has recently become incorporated and proposes to attempt to raise an endowment fund of one million dollars, of which one hundred thousand dollars has already been promised.

BULLETIN No. 79 of the New York State Museum gives a comprehensive account of the mosquitoes occurring in New York State, with special reference to methods of control. Some 55 species are treated, the larvæ or wrigglers of 43 being described, with accounts of their habits and life history. Tables for the separation of adults and larvæ are given, and the value of the work is enhanced by over 100 original line drawings and 57 process plates reproduced from the author's photomicrographs. The keys and illustrations should enable physicians, and in fact almost any person having a fair microscope at his disposal to identify most of the common forms either in the adult or larval stage. This bulletin should also appeal to teachers interested in nature study since no group of insects lends itself more readily to class room conditions.

ACCORDING to the *British Medical Journal* the medical profession is fairly well represented in the senate of Canada as well as in the Canadian House of Commons. There are nine in the former and fifteen in the latter body. In the United States Senate there are only two, while there are none in the House of Representatives. France is still the country where medical men are most prominent in politics; in the Senate there are thirty-nine, and in the Chamber of Deputies fifty-one.

THE *Geographical Journal* states that an important expedition for the purpose of exploring the interior of Dutch New Guinea, organized under the auspices of the Netherlands Geographical Society, started early in 1904. The leader is Mr. R. Posthumus Meyjes, who has with him various assistants, including Dr. Koch as natural history collector. On the way out to the East, Mr. Meyjes stopped at Florence, where he met and consulted with Sir W. MacGregor, the naturalist; travelers Beccari and Loria, and Professor Giglioli. After the arrival at Batavia, some

time was taken up in preparations, including arrangements for coolies, military escort, and so forth. Arriving at Merauke (New Guinea) on April 5, Mr. Meyjes did some preliminary work in the way of surveys and observations on the south coast of New Guinea, making a trip also to Thursday Island in order to connect his surveys with previously fixed positions. At the date of his last letter, Mr. Meyjes had returned to Surabaya and Batavia to make the final arrangements for the main expedition.

The *Scottish Geographical Magazine* is informed by Mr. W. S. Bruce that the Argentine relief ship *Uruguay* sailed from Buenos Ayres for the South Orkney Islands, to relieve the meteorological party at the station there about the middle of December. We may therefore expect the arrival of Mr. R. C. Mossman about the end of February. Progress is being made with the working out of the collections by various specialists, amongst whom may be named Professor J. Arthur Thomson, who is doing the Alcyonaria; Professor Hepburn, the histology of the Weddell seal; Dr. Waterston, penguin development; Mr. W. Eagle Clarke, the birds; Mr. R. M. Clark, the plankton; Mr. T. V. Hodgson, Pycnogonids and Isopods; Sir Charles Eliot, Nudibranchs.

Reuter's Agency is informed by the Pacific Cable Board that by an arrangement between the Washington and Sydney Observatories, with the cooperation of the telegraph administrations concerned, time signals were sent on New Year's Eve from the Washington Observatory to the Sydney Observatory. Mr. Lenahan, of the Sydney Observatory, reports as follows: "The first set of signals were received satisfactorily, the 3 P.M. contacts being recorded here at 3 hr. 0 min. 3/57 sec. The second set, only 30 signals, were received altogether, the 4 P.M. signal reaching here at 4 hr. 0 min. 3/66 sec. The third set was satisfactory, the 5 P.M. signal reaching here at 5 hr. 0 min. 2/76 sec. The fourth set was satisfactory, the 6 P.M. signal reaching here at 6 hr. 0 min. 2/55 sec., the final mean being 3/14 sec. Cutting out the second set, the mean gives 2/90 sec. This concludes the arrangements at present existing, and the rapid time in sending the great distance separating Sydney and Washington, over 12,000 miles, is a triumph to the electrical departments of the states concerned. With many thanks and every good wish for the new year." The signals through the Vancouver-Fanning cable, the longest cable span in the world (3,457.76 nautical miles), were sent by automatic apparatus, and were recorded, as they passed, at the Vancouver station on an instrument placed in the artificial line which balances the cable for the purpose of duplex working. The signals consisted of second contacts, omitting the 30th and last five of each minute, except the last minute of the hour, when the 30th and all after the 50th second were omitted, the circuit closing with a long dash on the even hour. The signals were sent for five minutes before the hour from 3 P.M. to 6 P.M., Sydney time, equivalent to midnight to 3 A.M. Washington time.

It is stated in *Nature* that the committee for the scientific exploration of Lake Tanganyika (consisting of Sir John Kirk, Dr. Sclater, Sir W. Thiselton-Dyer, Professor Lankester, Dr. Boulenger and Mr. J. E. S. Moore) has lately received news of the progress of its envoy, Mr. W. A. Cunnington, who left England in March, 1904, under directions to continue the researches carried out by Mr. J. E. S. Moore during his two expeditions to Lake Tanganyika. Proceeding by the Zambesi and Shiré route, Mr. Cunnington was most kindly received at Zomba by Sir Alfred Sharpe, who granted him the assistance of two native collectors. Mr. Cunnington had instructions to devote his special attention to the lacustrine flora and fauna of Lake Tanganyika, and, as he passed up Lake Nyassa, began his investigations in that lake, in order to be able to compare its products with those of Tanganyika. On Lake Nyassa Mr. Cunnington was able to get a good number of tow-nettings from different parts of the lake's surface, and obtained, on the whole, a large quantity of its characteristic phytoplankton, besides a considerable amount of zoo-plankton, consisting mostly of Copepoda, Cladocera and insect-larvæ. The temperature of the water of Lake Nyassa was observed

to fall seldom below 70°, while the temperature at 76 fathoms below the surface was ascertained to be about three degrees higher. Mr. Cunnington arrived at Karonga, at the head of Lake Nyassa, at the end of June, 1904, and traveled on to Tanganyika by the ordinary route of the Stevenson road. His last letters from Tanganyika are dated at Vua, on October 29, 1904. He had obtained a dhow from Ujiji, which enabled him to make his stay at different places on the lake longer or shorter according as he found much or little to collect. A good series of fishes had been preserved, and many freshwater crustaceans. As regards the vegetable life, Mr. Cunnington had been much struck by the near resemblance of all the forms obtained in Tanganyika to those which he had collected in Nyassa, though he could not say that they were specifically identical. From Vua, Mr. Cunnington had arranged to cross to the east coast of the lake, and to go some distance further north before returning to the western shore. Mr. Cunnington may be expected to return to England before the end of the year.

THE annual general meeting of the Association of Teachers in Technical Institutes was held at London on January 18. According to the London *Times*, the chairman, in opening the proceedings, said that the association had been constituted in October, when a committee had been formed for the purpose of drafting a constitution and rules. The purpose of the present meeting was to consider the constitution and rules which had now been drafted, and to elect officers for the association. They were all agreed upon the necessity for some association which should form a union of teachers in polytechnics and technical institutes of all kinds. Two hundred members had already joined; and he believed that when they had made a start and the association had become a national one they would have a very large number of members, and their body would play an important part in organizing tertiary education in this country. After the chairman's address, the members ballotted for the election of officers with the result that Mr. W. J. Lineham was elected chairman, Mr. J. B. Coleman, Mr. C. Harrap and Mr. S. G. Sterling, vice-chairmen, and Mr. J. Wilson, secretary. The following are the objects of the association, which were drawn up by the provisional committee, and agreed to after discussion: (*a*) The advancement of technical education generally; (*d*) the interchange of ideas regarding the methods of technical teaching; (*c*) the promotion and safeguarding of professional interests in such matters as tenure, salaries, pensions, registration, training and qualification of teachers, schemes of examination and inspection; (*d*) to lay the views of technical teachers before the various educational authorities and the public; (*e*) to enable teachers in technical institutes to cooperate as a body with other educational or scientific associations where desirable; (*f*) to render legal advice and assistance to members wherever possible and desirable; (*g*) to institute an employment bureau; and (*h*) to create a benevolent fund for needy members as soon as the society shall be strong enough to do so. It was further agreed that all teachers in technical institutes should be eligible for membership with the exception of those who are engaged solely in secondary school work, a technical institute being defined as any institution existing mainly for the teaching of science or art as applied to industries or crafts.

THE London *Times* prints daily an extract from its issue of a hundred years ago. The first extract of a scientific character that we have noticed is from the issue of January 23, 1805, and reads as follows: "It is not long since we heard, from Prussia, of a variety of experiments for extracting sugar from the beet-root (*beta* of the *pentandria digynia* of Linnæus). We were told, that a square plot of twenty-four miles, in the dominions of Frederic William, were to be devoted to this produce; and that the kingdom, ever after, would be rendered perfectly independent of the West India Islands, for a supply of the saccharine material. Whether the controversy of P. Terentius, and Varro Atacinus, on the antiquity of the use of this commodity, be of any importance, we will not affect to determine, but we may venture to assert, that the discovery of M. Achard, for the prepara-

tion of sugar from the vegetable we have named, deserves not only the attention of the chemist, but of the politician, considering the expanded interests of Europe and Africa as connected with the state of the Western Archipelago. The method of M. Achard is as follows: The roots are first carefully cleansed from all impurity; they are then cut into small pieces, and exposed to the bearing of a powerful press. The sugar under this process exudes from the vegetable mass, and in this state it appears glutinous, and of a dark color. Besides the saccharine matter, it abounds with albumen, extractive matter, and other substances, which must be separated from it; and the only difficulty attending the operation, is the exclusion of these impure and redundant ingredients. To effect this, he mixes in a cauldron of tin, or of tinned copper, one hundred pounds of the extract, in the state we have described, with three ounces and six drams of the sulphuric acid diluted in about a pint of water. The ingredients are afterwards poured over into vessels, to remain for the space of twelve, eighteen, or twenty-four hours. Twelve hours is a competent interval for ordinary purposes, but twenty-four is more beneficial, and the acid prevents the sugar itself from undergoing any pernicious alteration. The next step is, to separate the sulphuric acid from the extract; and this is done, by incorporating with the sugar seven ounces and a half of wood ashes, and afterwards two ounces and six grains of slacked lime. By these means, the sulphuric acid will disunite from the albumen, and the ashes with the lime will separate the acid, which will appear in the state of an insoluble salt. The application of lime is not at all new in our sugar refineries, indeed, it is constantly employed to assist the crystallization. The only thing requisite to complete the process of obtaining sugar from the beet root, is to clarify the saccharine residuum, and this part of the operation is so generally understood, that no explanation is necessary."

UNIVERSITY AND EDUCATIONAL NEWS.

The Union Theological Seminary of New York City, one of the few theological schools of university standing, has received an anonymous gift of $1,100,000, which includes a site adjacent to Columbia University, where new buildings will be erected for the seminary.

Mr. Bradford Merrill, of the New York *World*, has made a statement on behalf of Mr. Joseph Pulitzer in regard to the school of journalism established by him at Columbia University. It appears from this statement that Mr. Pulitzer has decided that the school shall not be established until after his death. Mr. Merrill says: "To avoid all uncertainties or misconception, I may add that the endowment of the college is absolutely irrevocable, and its establishment beyond a shadow of doubt. The first million is already in the actual possession of Columbia University. The second million is legally provided for, as well as a still further voluntary sum not mentioned in any agreement. Even the nomination of the advisory board is made in an instrument that will take effect instantaneously at Mr. Pulitzer's death."

Mr. Andrew Carnegie's gift of $125,000 to Oberlin College for the erection of a library building, which we recently noted, was conditioned upon the raising of $100,000 for endowment. The gift of Mr. Carnegie makes up $300,000 of the $500,000 necessary to secure the $100,000 given by an anonymous Boston donor. To secure the latter, $200,000 must be raised by July 1, 1905.

Mrs. Goldwin Smith has given $20,000 to Cornell University.

By the will of the late Edward A. Goodnough, of Worcester, gifts are made as follows: $25,000 to Mount Holyoke College, $15,000 to Iowa College, $25,000 to the Huguenot Seminary in South Africa, $5,000 to Washburn College in Kansas, $10,000 to Drury College in Missouri.

Sir John Nutting, of Dublin, has given $25,000 to Trinity College for scholarships.

Dr. Eugene Park Cowgill, of the University of Missouri, was recently elected to the position of instructor in physiology, University of Kansas. He began his duties with the opening of the new year.